DIE CASTING FORECAST ISSUE

PMM

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

SEPTEMBER
1956

devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

AMC's new air-cooled V-4 engine
. . . die castings help keep it light

See Page 3

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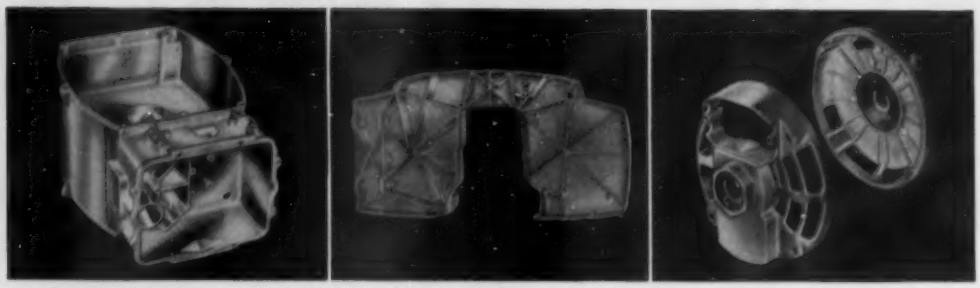
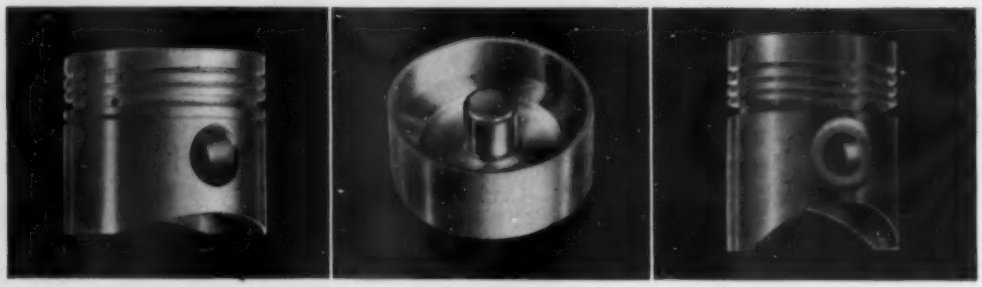
for die castings



...permanent mold castings

...impact extrusions



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COVER STORY

NEW 4-cylinder engine coming from American Motors research department is an important new use on the horizon for aluminum die castings. See page 54.

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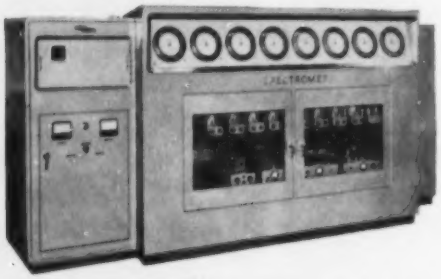

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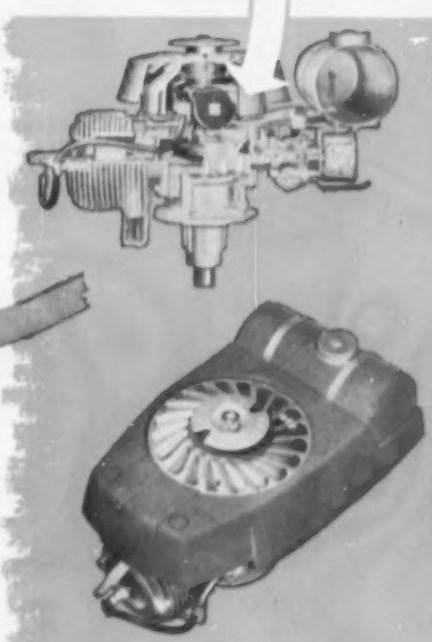

The magnetos are a part of the fractional horsepower engines manufactured by Power Products Corp., Grafton, Wis.

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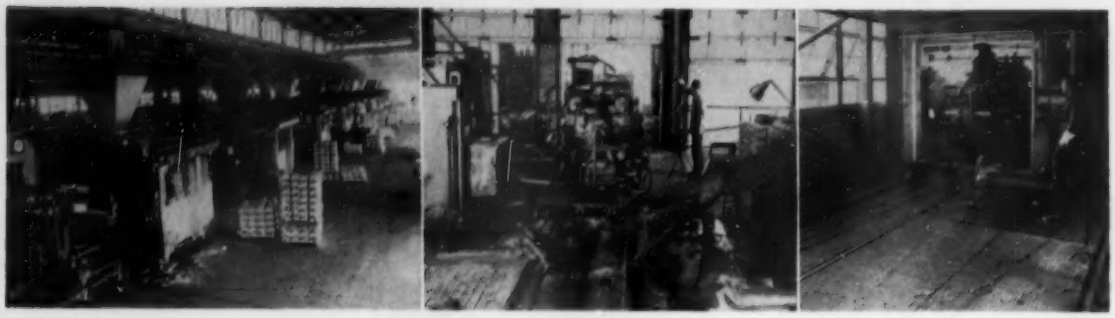
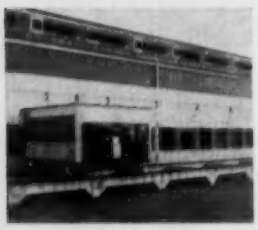
CASTING ABOUT

technical news of applications & processes involving precision metal moldings



Machines on rails . . . can be moved out quickly . . . and replaced

DIE CASTING MACHINES ON RAILS are a big time-saver in the brand new die casting plant that the Doehler-Jarvis Div. of National Lead Company has built on the outskirts of Pottstown, Pa. To save on downtime during die changeover, the company has introduced a unique system of changing machines instead of dies . . . the machine with the old set of dies is run out on tracks to the service department, and a machine with a new set of dies installed, pre-heated and ready to go is hauled in on rails. Downtime often runs as long as 15 to 20 hours by the conventional system; at Pottstown, this shift takes only 20 to 30 minutes. Here's how it works: when a job is finished running, the electric, water and hydraulic lines are quickly disconnected and the entire machine is pulled outside the building into a small "trolley building" that runs up and down the outside of the plant on a set of rails. The machine goes to the service area to be changed, and meanwhile, another machine comes in on the rails ready to be hooked up, and in a few minutes the new job is in production. The entire plant, incidentally, has a central hydraulic system using centrifugal pumps with 10" piping to each machine.



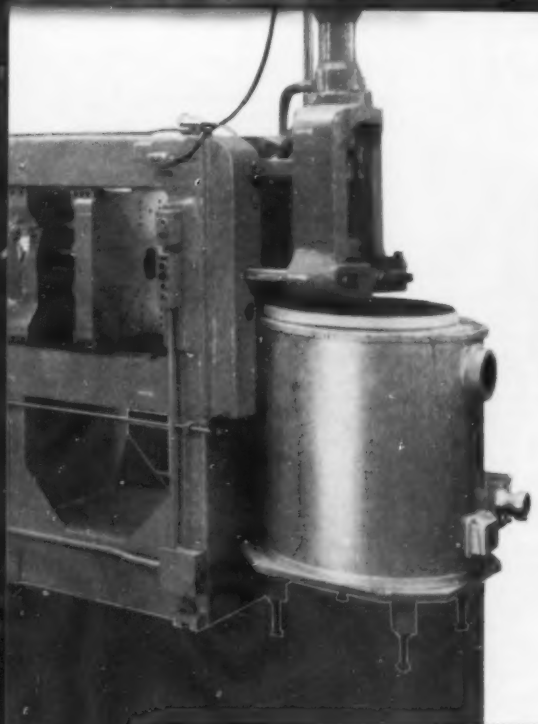
Trolley house

A MISSILE THAT FLIES LIKE A METEOR presents one of the most challenging engineering problems today, according to George F. Metcalf, general manager of General Electric Company's Special Defense Project Department Like meteors, these missiles descend from extreme altitudes at hypersonic velocities. But unlike meteors, they must not burn or disintegrate when they re-enter the dense layer of air surrounding the earth. "In a sense," Metcalf points out, "General Electric engineers and scientists are designing better meteors." The U.S.A.F. has recently awarded GE a prime contract on this top priority project of developing nose cones.

SEA-GOING DIE CASTINGS are giving dependable service, as is demonstrated by this Very pistol, that is constructed entirely of zinc die castings. This signal flare gun, made for the Signal Pyrotechnic Company, Los Angeles, Calif., is designed for use by all military services and by commercial ship skippers in conditions ranging from heavy Arctic seas to desert sandstorms. Zinc die castings were chosen because of their inherent strength, and ability to withstand the heavy "kick" of the flare cartridge, together with the good resistance to corrosion.

Three dies are used to produce these components on a Kux model BH-18 machine, by Grover Smith Manufacturing Corp. Casting is followed by trimming and broaching the barrel. The natural zinc surface is sufficiently resistant to corrosion, and is given no further protective treatment.

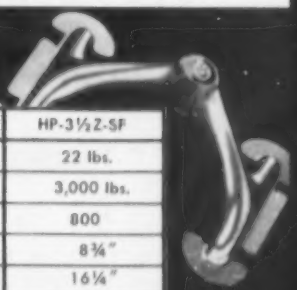
Continued on page 8



LESTER
DIE CASTING MACHINES
for ZINC

	HHP-2-ZE	HP-1½Z-SF	HP-2½Z-SF	HP-3Z-SF	HP-3½Z-SF
Maximum Die Capacity (Zinc)	6¼ lbs.	6¼ lbs.	9½ lbs.	15¼ lbs.	22 lbs.
Melting Pot Inventory	800 lbs.	800 lbs.	1,100 lbs.	1,700 lbs.	3,000 lbs.
Clamping Tonnage*	100	200	400	600	800
Equivalent Bar Size	2"	5"	6½"	8"	8¾"
Die Opens	9"	10"	12"	14"	16¼"
Clearance Between Beams (HxV)	14" x 12"	17" x 22¼"	18½" x 26"	26" x 28¼"	30" x 36"

*Established with strain-gage equipment simulating a die...under supervision of independent consulting engineer.



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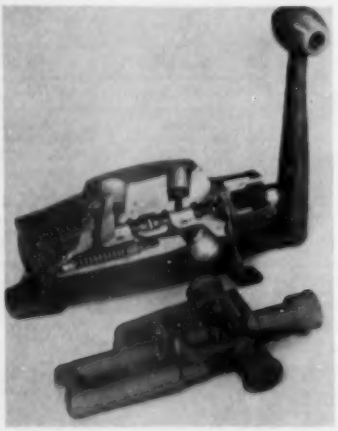
CASTING ABOUT

continued from page 6

AWARD WINNER for research in magnesium is Foster C. Bennett of The Dow Chemical Company's metallurgical laboratory, who has been given the annual Willard H. Dow Memorial Award in recognition of his development of an automatic hot chamber die casting machine. The award, consisting of $100 cash prize and a scroll, was presented by Dr. J. D. Hanawalt, Dow vice president and manager of the Magnesium Department. In addition to his work in research on the thermal reduction of magnesium and other metals in the Company laboratories, Bennett has also served as superintendent of the Dow die casting plant.

In past years, the award has gone to: A. T. Peters for pumping and direct chill casting of magnesium; H. A. Robinson, use of magnesium for cathodic protection; H. K. DeLong, electroplating of magnesium; J. L. Saunderson, development of a direct reading spectrometer; P. F. George, metallographic techniques for magnesium; G. Ansel, improved magnesium-zirconium alloy for extrusions and forgings; H. E. Swayze, development of magnesium applications in the printing field.



The zinc core in place

The aluminum die casting with the zinc core

A NEW WAY TO CORE OUT A DIE CASTING has been used successfully by Char-Lynn Company of Minneapolis, Minn., manufacturers of hydraulic equipment. Char-Lynn needed a valve that would protect any system against excessive pressure for a range of operation up to 2000 psi and surge pressures reaching a possible 5000 psi. In addition, valve volume capacity had to range from 2 gpm to well above 12 gpm.

Early in the planning stages, Char-Lynn found that production of the valve was impractical if standard coring techniques were employed. The answer was provided by developing a special casting technique to facilitate coring of the intricate aluminum die cast valve body. Coring is accomplished by first die casting a zinc core. The zinc core is then coated with an insulating material and positioned in the valve body die. Aluminum is then injected in the conventional manner. As the aluminum solidifies, the zinc core picks up heat and quickly becomes molten — causing a build-up in pressure. When the pressure reaches a pre-determined point a die valve is opened, relieving the pressure and allowing the molten zinc to be discharged from the die. When the aluminum casting has solidified it is removed from the die and the cycle is repeated.

This unusual die casting technique enables Char-Lynn to produce a valve design featuring a host of "cast-in" advantages. The coring of blind holes, undercuts, and other heretofore extremely difficult operations are accomplished with this new technique. There are no drilled holes to plug, and no drilling for porting is necessary. Production costs are kept unusually low; and production-line figures are at an all-time high.

Continued on page 14

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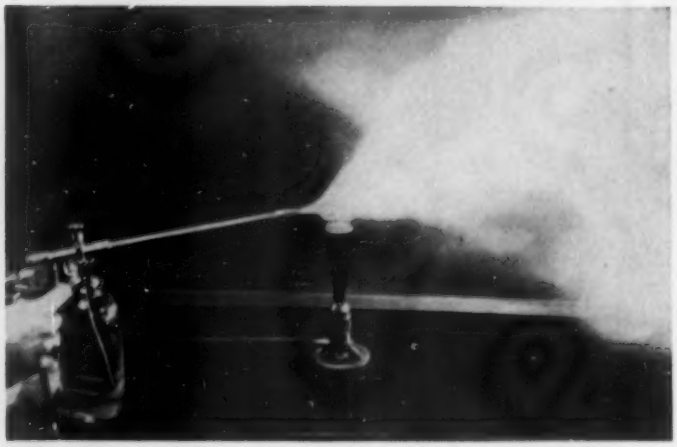
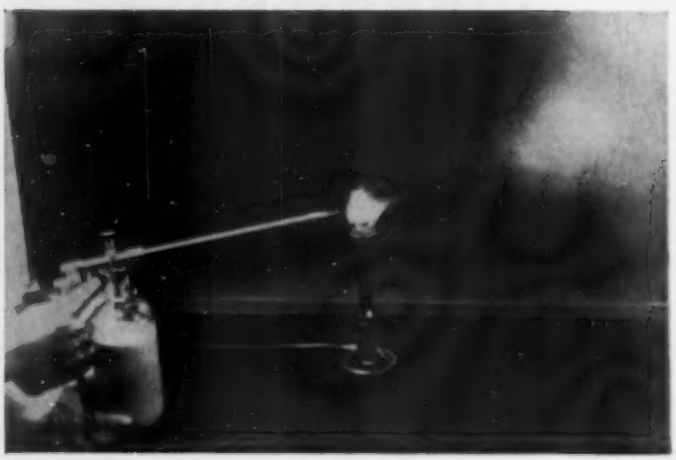


This photo shows the instant combustion taking place when a conventional hydraulic oil of mineral oil type is atomized over a Bunsen burner.

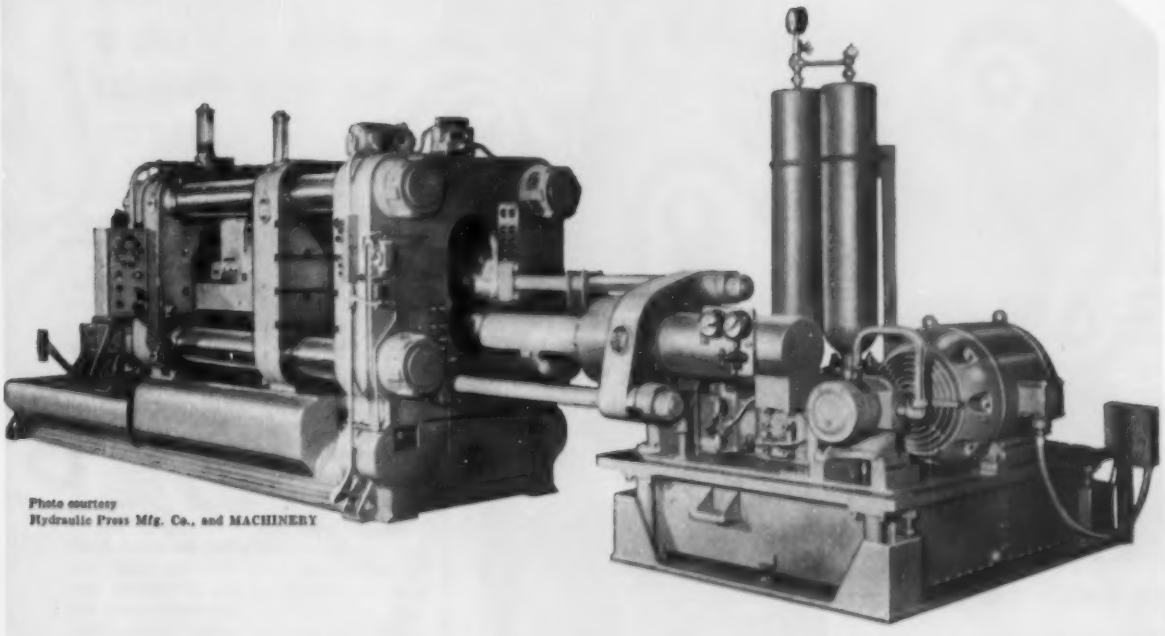


In this photo, Shell Irus Fluid 902 replaces the mineral oil. Note that there is no ignition.

SHELL IRUS FLUID 902

Oil-Base fire-resistant FLUID

SHELL IRUS FLUID 902



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Hydraulic Press Mfg. Co., and MACHINERY

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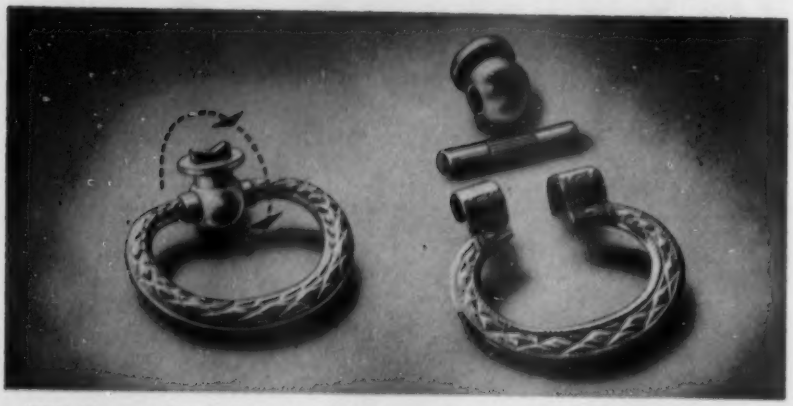

GRC "Intercast" swivel ring on left *cast assembled* complete in single operation.

Ring on right required assembly of two screw machine parts plus a metal stamping.

"Intercast", exclusive GRC cast-assembly process produces single units or continuously interlocked assemblies, ready for use.

Previously, Metalcraft Corp., leading manufacturer of picture frames needed *two screw machine parts, a metal stamping plus two assembly operations* to complete their picture frame swivel rings. With Gries "Intercast" production, *a single automatic operation casts the unit completely* assembled, trimmed, *and ready for use.* Metalcraft eliminated assembly entirely, *effected economies of over* 50% and received a more attractive component.

"Intercast" is only one of the exclusive Gries die casting techniques and processes that offer industry drastic reductions in production costs and new opportunities for improved design. Unique GRC machines turn out simple or intricate small parts, complete, in one high-speed automatic operation. Many manufacturers have found that Gries facilities give them a better product while reducing costs and eliminating machining and assembly operations.

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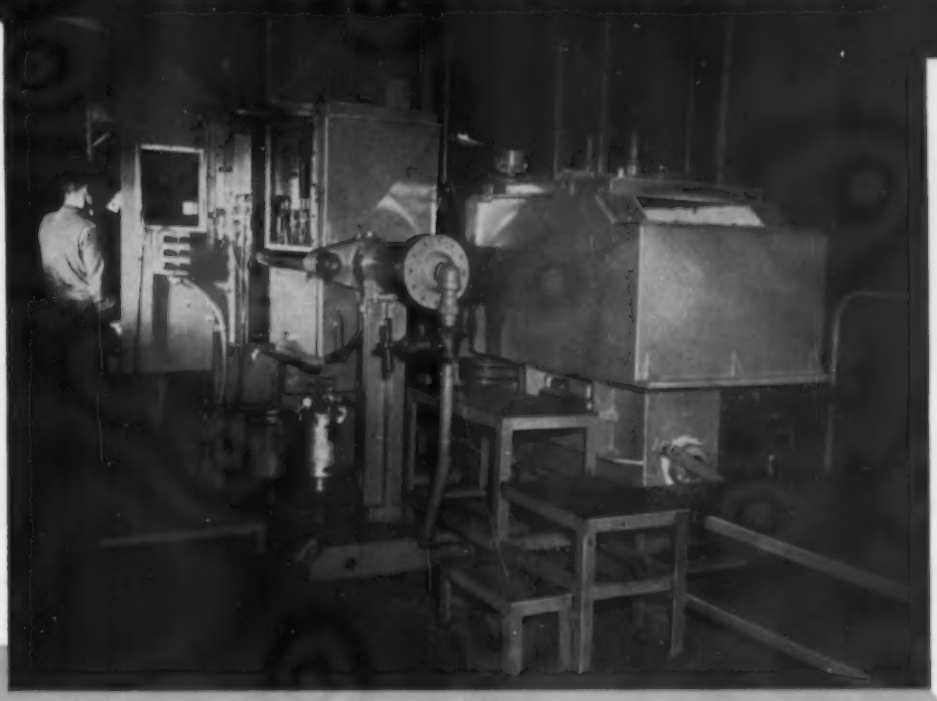

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AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
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AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

® Reg. U. S. Patent Office

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8 reasons

why you should switch to

UCON

brand hydrolubes

Carbide's Safety hydraulic fluids

1) The *fire-resistance* of water-base Ucon Hydrolubes has been proved by years of severe, exhaustive laboratory tests. In actual service, Ucon hydrolubes have prevented serious fires and injuries during more than eight years of routine use.

2) Ucon Hydrolubes have *no harmful effects* on packings and seals. Leakage losses are often lower than with other hydraulic fluids.

3) Ucon Hydrolubes can be *safely handled* by workmen.

4) Ucon Hydrolubes are made in *three standard viscosity grades*—200, 300, and 550 S.U.S. at 100°F. Other grades can be supplied to fit specific needs.

5) Ucon Hydrolubes have *high viscosity indexes*—150 to 160.

6) Ucon Hydrolubes are *good lubricants.* Special anti-wear agents provide satisfactory pump life and performance characteristics.

7) Ucon Hydrolubes contain effective liquid and vapor phase *corrosion inhibitors* for the common metals.

8) Ucon Hydrolubes have *low pour points*—a must for use at low temperatures.

Ucon Hydrolubes are the answer to the problem of improved safety with hydraulic fluids. Get all the facts. Write *today* for the booklet "Ucon Hydrolubes," Form 7380.

CARBIDE AND CARBON CHEMICALS

CARBIDE AND CARBON CHEMICALS COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, New York

The term "Ucon" is a registered trade-mark of Union Carbide and Carbon Corporation.

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CASTING ABOUT

continued from page 8

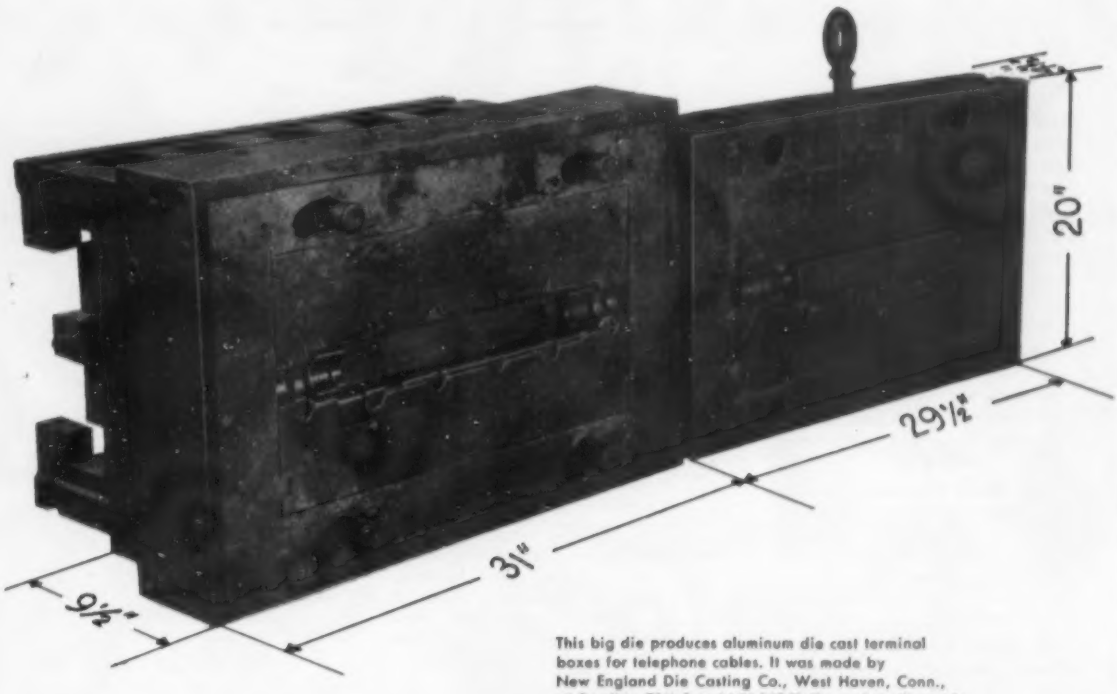
NEW IN METALS? A number of new developments will merit your attention. *New alloy* designed especially for steam turbine blades has been developed by Westinghouse Research Labs in Pittsburgh. Researchers say that properties of the new cobalt-nickel alloy (called Nivco) at 1200 F compare with those of a 12 percent chromium steel at 900 F. Outstanding properties: a 100-hour creep rupture life in the order of 50,000 psi, a dampening capacity about ten times that of similar alloys, and strength about five times that of 12 percent chrome steel. *3-millionth pound of titanium* metal has come from the ingot-melting furnace of Titanium Metals Corporation of America at Henderson, Nev. This consumable-arc, vacuum, double-melting unit melts homogeneous, commercially pure and alloy ingots 26" in diameter and weighing about 6,000 lbs. The furnace is built so that it can also produce ingots up to 10,000 lbs. in weight.

New magnesium producer has entered the field. Brooks and Perkins, Inc., magnesium fabricators, and Dominion Magnesium, Ltd., of Canada, have jointly incorporated a new firm, Alabama Metallurgical Corp. at Selma, Alabama, to produce magnesium. A multi-million dollar plant, scheduled to be in production by the end of 1957, will have a rated annual capacity of 10,000 tons of high purity magnesium.

Cobalt data center has been set up at Battelle Institute in Columbus, Ohio, to gather and organize technological information on cobalt. Supported by major cobalt producers, its aim is to air and encourage cobalt research by providing technical and economic information.

ALUMINUM CHAINS will be manufactured now by one of the nation's largest producers of iron and steel welded chains. The Columbus-McKinnon Corp. of Tonawanda, N.Y., will make the light-metal chain for decoration purposes, for guides to enclose areas such as parking lots.

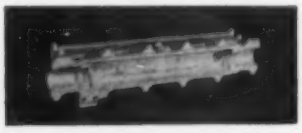
SURFACE PROTECTION of magnesium is the subject of a research report just published by OTS, Department of Commerce. In 187 pages, it reports on research toward development of an accelerated performance test for treated magnesium alloys. It described work done in setting up much-needed test methods for evaluating quality of chemical and electro-chemical surface treatments with respect to corrosion resistance. It is available for $4.75.



This big die produces aluminum die cast terminal boxes for telephone cables. It was made by New England Die Casting Co., West Haven, Conn., of Crucible CSM 2 and NU DIE V die casting die steels.

it's made of

ultrasonically inspected



CSM 2 and NU DIE V

...from Crucible warehouse stock

The die above, built by New England Die Casting Company, West Haven, Connecticut, casts aluminum electrical terminal boxes. The holder block is prehardened CSM 2 – the insert NU DIE V – both promptly obtained from local Crucible warehouse stocks.

Crucible CSM 2 and NU DIE V are made for and inspected to die casting steel quality. They're an unbeatable combination – perfect for holder blocks, solid dies, inserts or sleeves – for any die casting application.

What's more, delivery is from local warehouse stock – in 438 sizes – 1" to 40" wide . . . ¾" to 15" thick – all ultrasonically inspected. You just can't beat Crucible die steels for quality or availability. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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DATA OFFERED IN THIS MONTH'S ADS

the Reader Service Cards on the facing page will get you these free reference materials. Circle the numbers and mail.

1. **1000 Shots Per Hour**—according to bulletin A-10, an engineering report on small die casting machines, from ABC Die Casting Machine Co.

3. **Colloidal Dispersions for Castings**—Bulletin 425 from Acheson Colloids Co. describes the different lubricants available for foundry use.

4. **Induction Melting**—provides the best control of both temperature and composition. For complete details, Ajax Electrothermic Corp. has information bulletins and data.

6. **Alloy Metal Powders**—The use of these powders in the fabrication of parts and the properties of the parts made from them are covered in detailed reports from Alloy Metal Powders, Inc.

7. **Low Cost, High Speed**—die casting machines are described and all of the specifications given in an illustrated folder from the American Die Casting Machinery Co.

9. **Die Casting Alloys**—A booklet "Die Casting Alloys" has been issued by Apex Smelting Co. Mechanical and metallurgical properties of the as-cast alloys are given.

14. **Melting Fluxes**—for use with zinc in the die casting industry are the subject of a technical bulletin from Atlantic Chemicals & Metals Co.

16. **Die Casting Machine Specifications**—The complete specifications on the different models of die casting machines now being built are given in literature from B & T Machinery Co.

21. **Spectrographic Equipment**—Technical information is available on the complete line of spectrographic equipment for metal analysis in production and fabrication offered by Baird Associates—Atomic Instrument Co.

22. **Small Parts Die Casting**—machines are described in a 24-page booklet, "Die Casting Small Parts." Copies are available from DCMT Die Casting Machines Div., British Industries Corp.

23. **Improved Hydraulic Fluids**—The booklet "Ucon Hydrolubes" discusses the advantages of a water-base, fire-resistant hydraulic fluid that has been proved by years of laboratory tests at Carbide & Carbon Chemicals Co.

24. **Complete Alloy Service**—is offered in a new bulletin and technical data on special, rare, and vacuum-melted alloys from Cannon-Muskegon Corp.

25. **Die Casting Machines**—Extra heavy, all-steel linkage is said to be one of the bonus features of Cast-Master, Inc. die casting machines described in the latest catalog.

28. **600 Ton Die Casting Machine**—In a well illustrated bulletin, Cleveland Automatic Machine Co. describes and gives complete data on their new hydraulic die casting machine.

30. **Investment Castings**—Important features of their Accumet process for producing stainless steel investment castings are presented by Crucible Steel Co. of America in a new folder.

38. **Vacuum Casting**—The advantages of investment cast parts that have been vacuum cast are described in literature from Engineered Precision Casting Co.

41. **Improved Cutting Oil**—Bulletins describing the many lubricating specialties made by Fiske Bros. Refining Co. are available. One of the newest is a cutting oil for both ferrous and non-ferrous metal machining.

42. **Shell Molding Resins**—A 28 page manual has been prepared by General Electric Co. on the techniques and benefits of shell molding foundry practices.

43. **Small Die Cast Parts**—Separate bulletins are available from Gries Reproducer Corp. on their small part die casting facilities as well as the new Intercast process for single-unit assembly.

45. **Brass, Aluminum Die Castings**—A brochure has been published by Hampden Brass & Aluminum Co. that gives details about the experience, facilities and equipment of the company.

46. **Fluxes For Aluminum or Zinc**—A technical bulletin giving important information on fluxing procedures and improved shop practice has been issued by the Haviland Products Co.

48. **Design of Investment Castings**—A brochure has been published by Hitchiner Mfg. Co. that will aid the engineer in designing for the most economical and best use of investment castings.

50. **Advantages & Economies**—of die castings are explored in a file folder recently published by The Hoover Co.

51. **Fire Resistant Fluids**—Protective hydraulic fluids are the subject of informative literature discussing Houghto-Safe offered by E. F. Houghton & Co.

53. **Furnace Refractories**—Complete technical data are available on the several different refractory materials for repairing and lining metal melting furnaces made by Harbison-Walker Refractories Co.

54. **Threaded Inserts**—Four bulletins on threaded inserts are available. One is an application chart and the other three are design data. All can be obtained from the Heli-Coil Corp.

57. **Investment Castings**—In a booklet, "Cast to Outlast," the International Nickel Co. discusses how production costs can be cut and quality improved through the use of investment castings.

58. **Casting Problems**—The Investment Casting Co. has issued a brochure to help design engineers with their special casting problems.

59. **New Trim Presses**—especially suitable for removing flash from die castings are introduced in bulletin 1956 from Johnson Machine & Press Corp.

60. **Melting Furnaces**—for investment casting, such as the new model ID, are discussed in literature from the Detroit Electric Furnace Div., Kuhlman Electric Co.

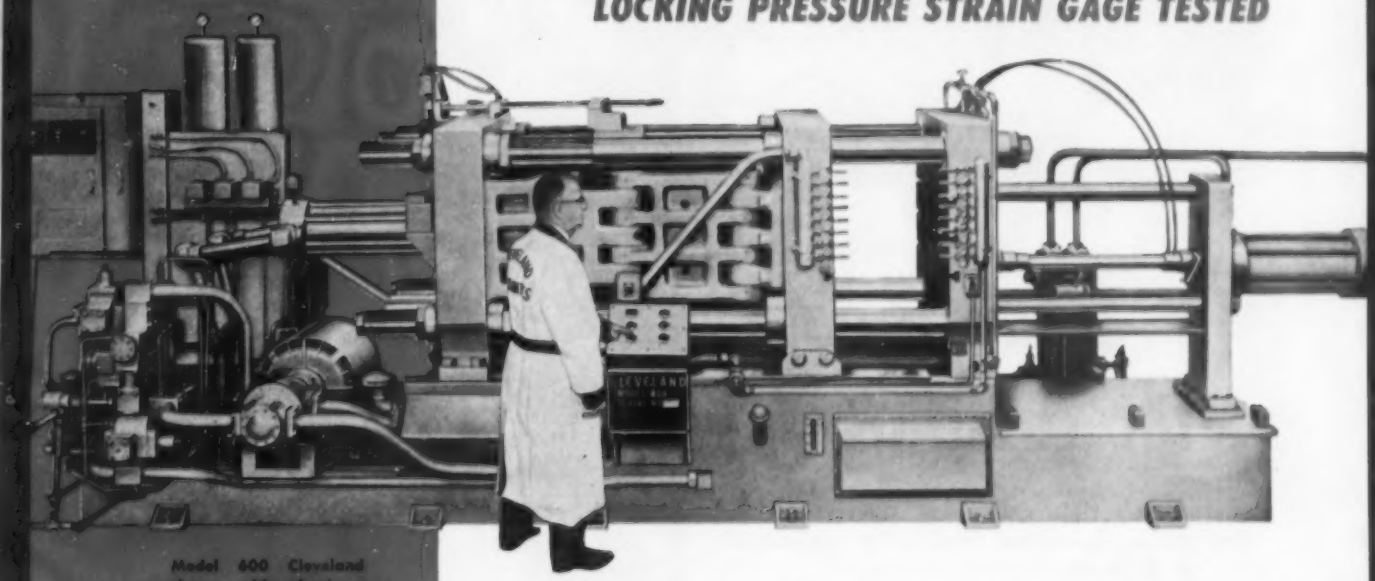
Continued on page 18

MODEL 600

GREATEST CLEVELAND YET!

New 600-Ton Universal Hydraulic Die Casting Machine

LOCKING PRESSURE STRAIN GAGE TESTED



Model 600 Cleveland shown with aluminum shot end. Also available as a hot chamber machine. Has 46½" x 46" die plates; 28" x 28" space between tie bars; 30" max.—10" min. die thickness; 8" - 15" die opening.

You're looking at the finest 600-ton die casting machine available today! The new Model 600 Cleveland was designed in every detail to give the die casting industry a machine of exceptional performance capabilities . . . high speed, reliable operation . . . safe and simple control . . . minimum maintenance. The developed machine more than met these specifications.

This new Cleveland will deliver castings weighing up to 10 lbs. aluminum, 25 lbs. zinc. An idea of the brawn built into the design—to back up its guaranteed 600-ton locking pressure—is indicated by the 38,000 lbs. net weight of the cold chamber machine shown above. Massive toggle system, 5" dia. tie bars and cross head guide bars, 7¾" thick platens, insure rigidity and accurate die alignment.

The hydraulic system is practically as leak-proof as can be built. Manifold valving is incorporated. Total pump capacity is 99 gpm. A 200 gal. oil reservoir is provided. Filter capacity is twice pump capacity. Two accumulators provide high injection speed.

Dozens of other highly important features—many are exclusively Cleveland's—are incorporated. You'll want to call in a Cleveland sales engineer for full details. In the meantime, factual information, well illustrated, in Bulletin 600 will give you plenty of incentive to reserve floor space for this new Cleveland in your shop. Write now for your copy.

Write for Bulletin 600

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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Westinghouse pilot plant for precision castings speeds development, saves capital investment

Proving ground for castings

Now . . . without heavy capital investment . . . you can prove your ideas and developmental work for molded metal products.

Modern pilot plant facilities are available at the new Westinghouse metals plant, Blairsville, Pa., to help you explore full production conditions and create prototype quantities. Here you can compare conveniently all types of castings at one place from the same heat.

Open production capacity is also available for fast, dependable delivery on precision investment castings (lost wax process), shell-mold castings and powder metal parts.

In making a value analysis of your product components, consider molded metal parts for pieces involving intricate shapes, close tolerances, difficult machining operations or component assemblies. You save machining, improve finishes, reduce rejections.

Send today for further details and a copy of DB 52-500. Also enclose a photo, drawing or sample of the part you want evaluated. No obligation. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-05001

WATCH WESTINGHOUSE!

WHERE BIG THINGS ARE HAPPENING TODAY!

For more information circle No. 95 on the Reader Service Card

DATA IN ADS

continued from page 16

65. Die Casting Machines—Complete information on their line of zinc die casting machines is offered in bulletin 101 from Lester-Phoenix, Inc.

66. Melting Furnaces—The Lindberg Engineering Co. bulletin 560 describes some of the many furnaces tailored to the specific needs for the die casting industry.

67. Designing Die Castings—A booklet on design of parts to be die cast has been prepared by Litemetal Dicast, Inc.

70. Packaged Conveyors—Complete information is available from May-Fran Engineering, Inc. on how to build up special conveyor systems from standard, stock components.

77. Zinc for Die Castings—More than 80 examples of production and sales advantages of conversion to zinc die castings are presented in a booklet from The New Jersey Zinc Co.

78. Plaster Mold Castings—A brochure from Ohio Precision Castings, Inc. describes the savings that are possible by casting small parts in plaster molds.

80. Uses For Die Castings—are discussed in the booklet, "Die Castings . . . Unlimited" published by Precision Castings Co. Savings on machining, assembly, and unit costs are revealed.

81. Stainless Steel Plunger Rings—A special bulletin has been issued by Precision Piston Rings, Inc. on the properties and advantages of their stainless steel plunger rings.

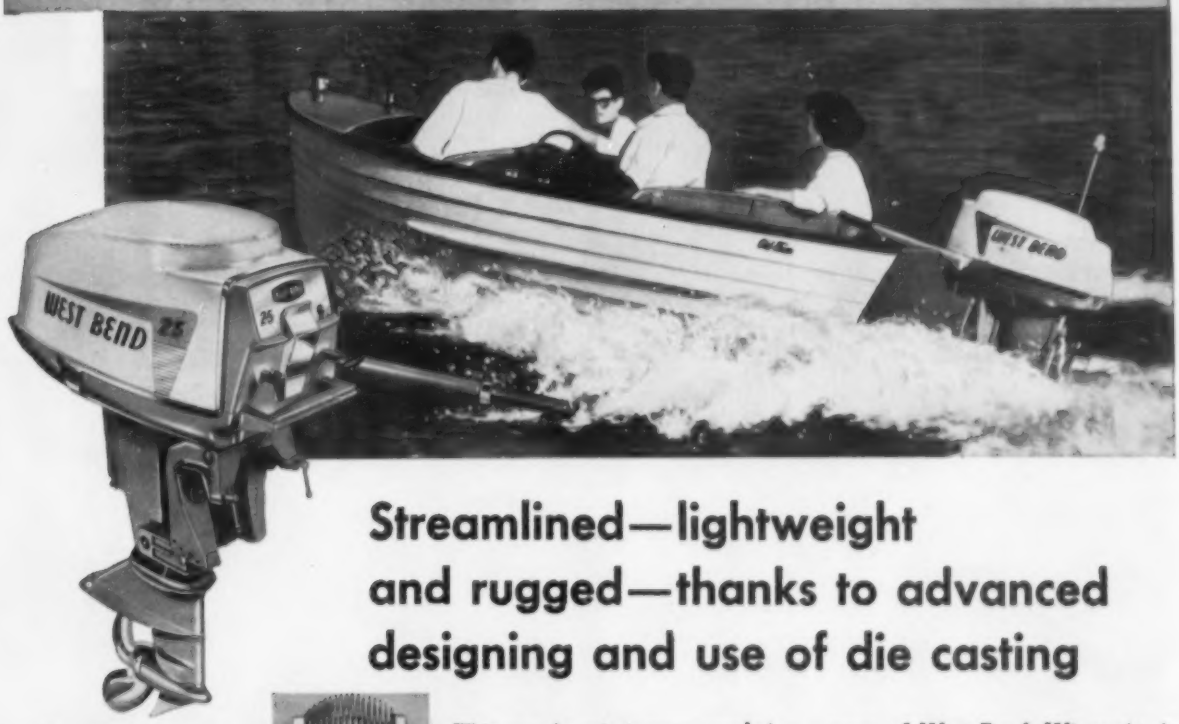
84. Vacuum Die Casting—Full information on the advantages of the Vacucast Process for zinc die castings is available from Reed-Prentice Corp.

87. Oil Base, Fire-Resistant Fluid—Test data and information has been released by Shell Oil Co. on Irus Fluid 902, an oil base, fire-resistant hydraulic fluid used as a direct replacement for hydraulic oils now in service.

88. Powder Metal Presses—A series of three bulletins has been issued by the F. J. Stokes Corp.—"Powder Metallurgy Today," catalog no. 801 on powder metal presses, and bulletin no. 670 on model 640 press.

Continued on page 128

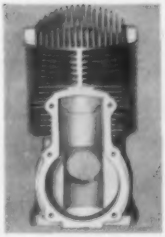
DIE CASTING REPORT



Streamlined—lightweight and rugged—thanks to advanced designing and use of die casting

4 cylinder sizes from one die!

Interchangeable cores in a master die enable Precision to produce 4 different sized aluminum cylinder blocks for West Bend.



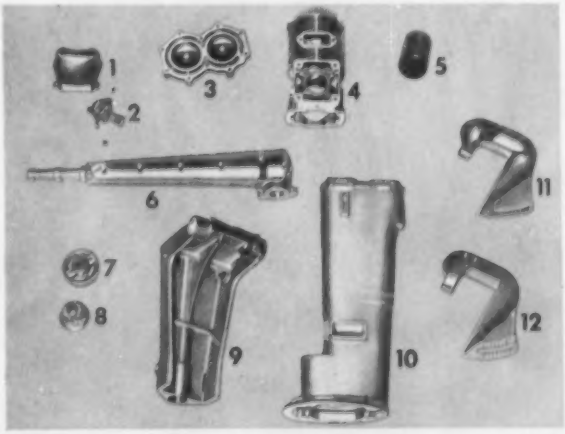
This year America's waters are being churned by a steadily growing outboard motor population. New companies entering this field have had to meet stiff competition from the "old line" producers. How have they done it?

The West Bend Aluminum Company, of West Bend, Wisconsin, is a good example. Their Hartford Division is currently putting on the market a line of high performance outboard motors ranging from 2 to 25 H.P. One of the most important factors in cutting down on excess bulk and weight has been the strategic use of aluminum die castings. Cooperative planning on die-cast design of components helped achieve compactness, streamlined appearance and light weight. All this without sacrificing strength where needed.

For production and assembly savings, it will pay *you* to investigate the use of die-castings. Let the Precision team of experienced die design engineers look at your problem. The result! Savings on machining, assembly and unit cost!

Typical Aluminum Outboard Motor Parts

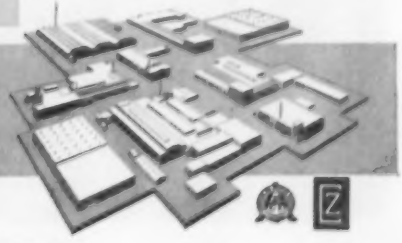
1. Transfer port cover
2. Gas pump cover
3. Cylinder head
4. Cylinder block
5. Steel bushing insert
6. Steering handle
7. Bearing cage
8. Slip clutch plate adapter
9. Swivel bracket
10. Drive shaft casing
11. Stern bracket
12. Stern bracket



Write on your letterhead for free copy of "DIE CASTINGS ... UNLIMITED" Precision Castings Co., 42 Warren St., Fayetteville, N. Y.

PRECISION CASTINGS CO.

A DIVISION OF **HARSCO Corporation**



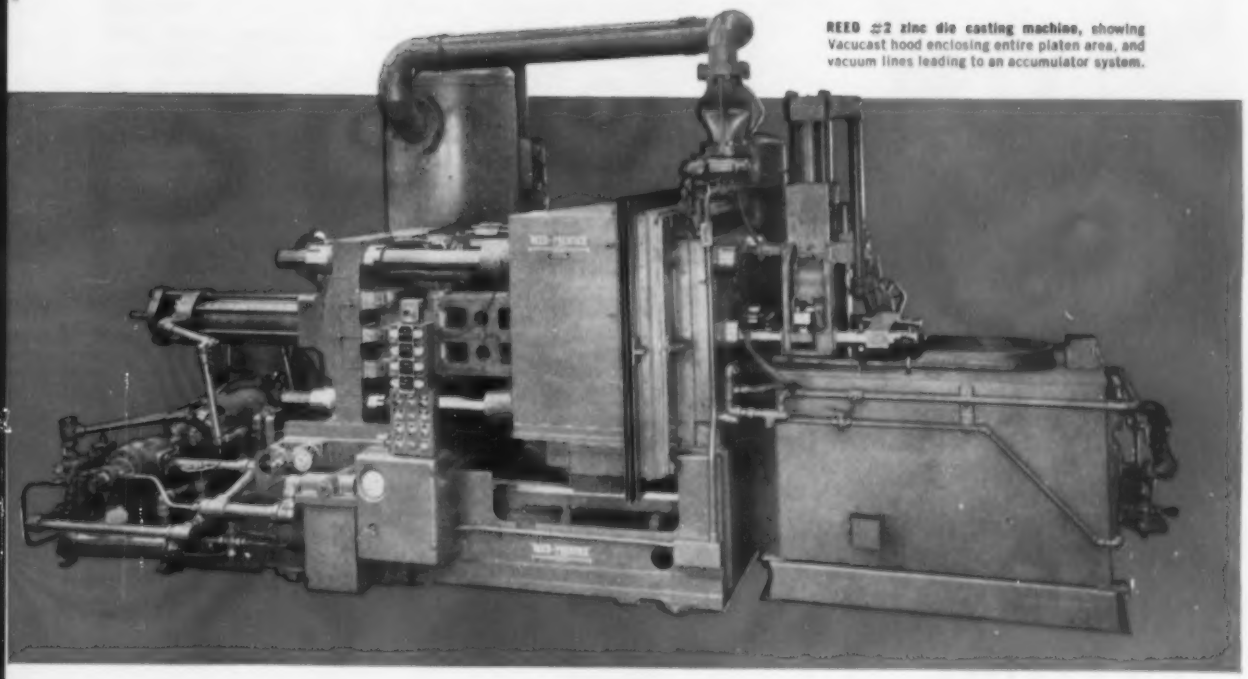
FAYETTEVILLE, N. Y.—SYRACUSE, N. Y.—CORTLAND, N. Y.—NEW YORK, N. Y.
CHICAGO, ILL.—CLEVELAND, OHIO—KALAMAZOO, MICH.

For more information circle No. 80 on the Reader Service Card

Reed-Prentice announces the

VACUCAST PROCESS

...an exclusive new system that gives you improved zinc alloy die castings under vacuum



REED #2 zinc die casting machine, showing Vacucast hood enclosing entire platen area, and vacuum lines leading to an accumulator system.

Here's something really new in zinc alloy die casting — a vacuum system offered only by Reed-Prentice as original equipment on standard machines. The REED Vacucast Process has been 54 years in development, and has been conclusively proved on pilot production jobs running for more than a year. Reports from an independent testing laboratory, which compared standard-run non-vacuum and Vacucast zinc castings, show that this new method gives castings superior in both physical characteristics and uniformity.

You get all these advantages from a REED Vacucast operation:

- Rejects reduced by 50%.
- Plunger down time reduced . . . cycles cut by 20%.
- Surface quality of castings greatly improved, allowing for easier, more uniform plating.
- Hardness and strength of castings increased.
- Skin thickness in very thin castings increased as much as .02".
- Castings are less permeable.
- Permissible decrease in wall thickness provides appreciable metal savings.
- Existing dies can be used without alterations.

To get full information, write today to Reed-Prentice Corp., 677 Cambridge Street, Worcester 4, Mass. An Aluminum Self-Feeding Vacucast machine process, now under final development and test, will be announced shortly.

REED-PRENTICE

Affiliate of PACKAGE MACHINERY COMPANY

WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • CHICAGO • BUFFALO • DAYTON • DETROIT • KANSAS CITY • LOS ANGELES REPRESENTATIVE: MINNEAPOLIS — CHAS. W. STONE CO.

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THIS PLUNGER RING CAN SAVE YOU MONEY . . . TIME and Eliminate Lost Production

Precision UN-BREAKABLE TEMPERED and TREATED STAINLESS STEEL DIE CASTING PLUNGER RINGS

• The response to Precision's Stainless Steel Die Casting Rings has been tremendous. 75 new customers in 3 months. The reasons are obvious.

Precision Un-Breakable Plunger Rings are made of tempered and treated stainless steel. They are wrought, *not cast*, from dense, fine grain, flawless stainless steel. Engineered specifically for die casting machine applications, Precision Stainless Steel Plunger Rings give up to 8 to 10 times the average life of other rings. Produced under the most exacting methods, uniform tension and resiliency with long wearing, un-breakable and heat resistant qualities make it possible for plunger, groove and sleeve tolerances to be greater, thus eliminating unnecessary wear. Precision Rings are designed to allow for expansion under extreme heat and this feature with the characteristics of the stainless steel assures the finest, most dependable die casting plunger ring made.

Rings can be supplied in ¼" widths from 2¾" diameter up. They can be made to special diameters and widths.

Write for Precision's special bulletin on the stainless steel die casting plunger rings.

Precision's Engineering Department will gladly make recommendations on rings for your die casting plungers.

Precision PISTON RINGS, INC.

Sales Offices: INDIANAPOLIS–CHICAGO–LOS ANGELES–SAN FRANCISCO–NEW YORK–PHILADELPHIA

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PMM BETWEEN THE LINES

the editor's viewpoint on articles in current and forthcoming issues

CAN DIE CAST ALUMINUM BE COLOR ANODIZED IN PRODUCTION? Frankly, we don't know yet, but we're anxious to pass along to you any current developments along these lines. Two developments reported in this month's PMM are worth watching. A new alloy that is being color anodized successfully is reported by a New England die caster. Colors of samples we have seen are clear and bright, but so far, the final trial in production quantities has to be made. Because of the tremendous response to a letter in our Letters To The Editor column, we thought you'd want to know all about this new alloy, and have the story beginning on page 109. At the same time, vacuum die casting is being tried by one of the big primary aluminum companies as a means of forming an anodizable (but so far, un-die-castable) alloy. Vacuum die casting is reported on page 59.

NOT A STEP-CHILD OF THE AUTO INDUSTRY any more . . . not, at least, to the extent it once was . . . the die casting industry has been gaining ground in its efforts to diversify. The dangers of having all their eggs in the automotive basket have long been recognized by the die casting producers. High light of this year's Die Casting Forecast, pages 49-62, is the gain in non-automotive uses of die castings to help offset any slack in the sale of cars.

IT'S BEEN FIVE YEARS since we extended our coverage to include not only die castings, but also the complementary precision metal molding processes investment casting, permanent mold casting, powder metallurgy, shell mold casting and plaster mold casting. In September 1951, *Die Castings* magazine was expanded to take in related fields in the belief that the designers and buyers of die castings are the same men who specify the other types of precision metal components. Greatly increased volume of letters, reader inquiries and direct reaction to articles convinces PMM's editors that this assumption was true, and that the new editorial policy meets a real need.

TOO FEW DESIGNERS recognize where plaster mold castings fit into their products. Many are not aware that magnesium can be cast in plaster molds. A paper on the subject of magnesium plaster mold castings starting on page 68 gives the basic information you'll need with regard to tolerances, surface finish, size, shape limits and other data helpful in deciding where to use this type of casting.

THE EMPHASIS WILL BE METALLURGICAL next month, recognition of the special interests stimulated by the Metal Show in Cleveland. One of the special papers PMM's editors have obtained for this issue is a report on the development of special high temperature bearing materials for aircraft gas turbines engines. Dr. John Burwell of Horizons, Inc., has prepared a paper on the use of powder metallurgy to solve the problem of obtaining a material for bearing retainers.

DON'T OVERLOOK ALUMINUM PERMANENT MOLD FOR

MORE CASTING VALUE PER DOLLAR

New production techniques and finishing services have doubled the use of aluminum permanent mold castings during the past three years.

Monarch's continuous-melt furnaces and new finishes, such as Velvaglaze® and Spectraglaze, are examples of Monarch-pioneered methods for mass-producing quality aluminum permanent mold castings. These castings offer superior strength, metal structure and finishing qualities.

Monarch's progress has been accomplished in conjunction with the steady expansion of our proven die casting operations. Monarch's "non-competitive" experience in both casting methods will give you the right answer for mass-producing your product at the lowest end-cost.

SINCE 1913
MONARCH
ALUMINUM
PIONEERS IN CASTING PROGRESS

Velvaglaze, Spectraglaze and Monarcast are Trade Marks of

MONARCH ALUMINUM MFG. COMPANY—9205 DETROIT AVENUE—CLEVELAND 2, OHIO—OLympic 1-1700

MANUFACTURERS OF: *Aluminum Permanent Mold Castings • Zinc Die Castings • Aluminum Die Castings • Exclusive Velvaglaze Finishing • and Spectraglaze, colorful Porcelain Enamel on Aluminum Permanent Mold Castings.*

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from Crucible

Aircraft Quality STAINLESS INVESTMENT CASTINGS

in any shape or grade . . .

Can your product benefit from the important features shown in these Crucible Accumet® precision investment stainless castings? They are tube supports for jet aircraft engine assemblies, but the characteristics they illustrate are just as vital to thousands of other applications.

THIN WALLS – Accurately produced by the Accumet casting process, they are impossible to make in sand or shell mold castings – very difficult to forge.

BLIND HOLES – like this one, are impossible to forge, expensive to machine, and very difficult to sand cast . . . but they can be held to close tolerances by Accumet casting.

CORING – Deep or intricate cores – prohibitively costly to machine – can be economically produced by the Accumet process.

ODD SHAPED PARTS – difficult to chuck and machine, are economical when they're Accumet castings.

Next time your designs call for parts with intricate shapes . . . close tolerances . . . fine finish . . . high quality and uniformity, make them Crucible Accumet castings. They are available in any grade of steel or high alloy your product calls for. Let a Crucible engineer give you all the facts about how Accumet castings can save you time and money. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

Write for a **free** copy of the informative folder "Accumet Castings".

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 30 on the Reader Service Card

how to make your alloys behave .....all of the time!

If you want to make flawless die castings — all of the time — look first at the alloys you use. If your alloys aren't ***uniformly*** the best you can get, you'll always be in trouble.

When you make HB&S your steady alloy source, you can set your mind at rest—once and for all. Here's why:

- All HB&S alloys are specifically engineered to meet the most precise designing needs.
- HB&S laboratory control guards the purity and uniformity of all ingots you order, from start to finish.
- Spectrograph analysis is made of every heat. Every element in the alloy is "finger printed" for your protection.
- An identifying number is marked on every 2,000 lb. pallet of hot bars as they come off the conveyors. The heat number is on every ingot. You know exactly what you're getting.
- Alloy bars are shipped to you on consumable skids at no extra charge.
- You pay no more for HB&S quality — or quality control.

THESE AUTHORITATIVE REFERENCE GUIDES WILL HELP YOU GET THE BEST RESULTS FROM YOUR ZINC DIE CASTING ALLOYS

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- **"Die Casting with Zinc Alloys."** Technical guide for plant managers and die casting machine operators. Explains all factors that influence production of sound castings with good surface finish. (Booklet is available in quantities.)
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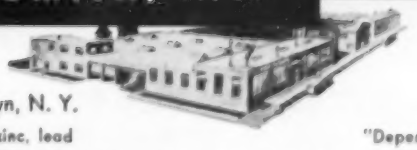

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The new ID Furnace features fast, indirect arc melting. Metal analysis is maintained without carbon contamination from the electrodes. The mold is clamped to the furnace when metal is ready and the mold is poured simply by inverting the furnace.

Let us tell you the complete story of operation and production advantages of the new ID Furnace. Write or call today.

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PMM LETTERS

the readers' forum

DIE CASTING SOURCES

We ran across your magazine in one of our customers' office and we thought it was extremely interesting.

We are wondering if you could give us some information. We would like to know the name of some precision die casting people who are in the Philadelphia area. We have several items that we would like to have quotes on and we thought possibly you could help us with this matter. — J.A.H.

As per your article in "Casting About" in July issue of "PMM" please forward request for sample of miniature pliers as produced by Gries Reproducer Corporation. Would also appreciate some literature on the interesting process for consideration in forthcoming product designs. A.K. (Plant Engineer)

We wonder if you might help us with a problem? We are looking for a source of supply for castings of miniaturized trademarks or nationally advertised products—eg, small finished castings of the "Flying Red Horse" of the Socony Vacuum Oil Company, The "Bulldog" of the Mack Motor Truck Company, etc. We are looking for a manufacturer with stock molds or the facilities for this type of work. We are advertising specialty manufacturers and will use large quantities of this merchandise. — N.S.

We are always happy to help any of our readers locate sources of casting supply. Names have been sent. — Ed.

ANODIZED ZINC?

On Page 8 of the current issue of Precision Metal Molding I noted with interest the announcement of the research project at Battelle Memorial Institute, commissioned by the American Zinc Institute.

It is gratifying to note that some fundamental work will be done in this field, but frankly, in all our years experience, we have, never heard of anodizing zinc die castings. Could this be an error? — L. E. W. (Superintendent of Finishing Division)

Continued on page 28

A Bolt from the Blue!

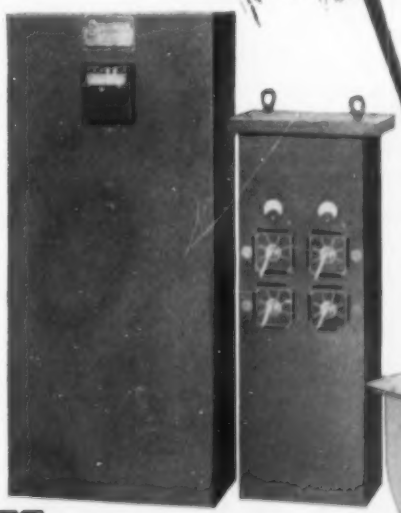
THE NEW STROMAN ELECTRIC RESISTANCE FURNACE

Accept this introduction to another new Stroman Furnace that will further facilitate the speedy production of aluminum castings for all die casting and permanent mold plants. Designed for holding only with a hot charge, it assures perfect metal and is exceptionally cool to work with. It can many extensive and labor as well as cost saving features. Here are just a few of them:

- Absolute Quiet Zero— No Turbulence
- Extremely Low Dross Formation
- No down time
- Low heat input—[illegible] conservation
- Resistance [illegible] can be replaced while furnace is in operation
- Metal can be carried overnight or over week-end without damage or appreciable loss
- Absolutely noiseless in operation
- Bath capacities 500-800-1500 lbs.
- Maximum aluminum temperature 1550°
- Completely Automatic Safety and operating controls
- Complete Package Unit consisting of Control Panel . . . Transformer and Furnace is delivered ready to operate on 220V or 440V—3 phase 60 cycle AC
- If furnace freezes due to power failure or cools, charge can be reheated and melted out without any damage to furnace
- Lining is made of standard brick shapes available at any local source. This eliminates cost of special shapes or ramming materials

While linings last for years, if replacement is necessary it is easily accomplished as everything is readily accessible. New linings can be done [illegible] regular working [illegible]

- This [illegible] Stroman Electric Resistance Furnace [illegible] with an AUTOMATIC [illegible] if desired
- Remember . . . no pots to [illegible] or replace . . . and it occupies considerably less floor space than gas or oil furnaces



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FURNACE & ENGINEERING CO.

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THE PETERSON OVEN CO. [illegible]
For more information circle No. 40 on [illegible]

FIRE

Why—in this scientific age—do we still have old-fashioned fires that destroy even some of our most modern manufacturing plants?

One reason is that we sometimes flirt with fire without knowing it. For instance: How far would fluid spray if a hydraulic line or hose would break in your plant? Under no more than working pressures, it could be 40 . . . 50 feet—or farther!

If there's ever hot metal, open flames, or any other high temperature hazard within that radius, you're flirting with fire—unless you're protected with a fire-safe hydraulic fluid.

You can get this protection, get it easily with no loss of hydraulic efficiency, from Houghton. *Houghto-Safe,* Houghton's fire-safe hydraulic fluid, gives you complete fire protection, and has proved itself in industry's toughest hydraulic applications.

Houghto-Safe works for the Navy, too. For more than two years, it has been the only hydraulic fluid used in the huge hydraulic catapults that fire navy planes into the air from carrier decks.

Get complete information on Houghto-Safe from your Houghton Man—or write E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

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LETTERS

Continued from page 26

No, it was no error. Anodizing of zinc has been performed for many years. In fact, one company has a proprietary method for applying an anodic coating to zinc and it is very successful on zinc die castings. It has a characteristic yellow color, but can be dyed black. It is not used generally for decorative purposes, but mainly for corrosion protection.—Ed.

TINIEST PLIERS

We have read with interest the article on Page 8 of your July issue "Tiniest Pliers", and would be pleased to receive a sample.

It is possible that in the design and production of some of our products we could use some unique zinc die castings, and would appreciate hearing from these people.

We are manufacturers of steel and aluminum windows and other metal building products. — R.F.Z. (President)

The response to the little item in our Casting About department has been overwhelming. All requests have been forwarded to Gries. — Ed.

NON-ELECTROLYTIC PLATING

Your article in the June issue of PRECISION METAL MOLDING on the New Non-Electrolytic plating process has been read with a great amount of interest. We are writing to the General American Transportation Corporation, whom you have listed as the process developer, for further information. We wish to make certain that our contact is made, so we are also writing to you for any further developments on this process which you may have.

From all appearances, we in the musical instrument business can use the process to great advantage. If you have any further data on the process, would it be permissible for you to send it to us? — L.P.S. (Chief Engineer)

The number of products which seem to suggest uses for this new Kanigen plating process are impressive. This, and other similar inquiries, have been sent along to GATX whose Kanigen Division is the only authority on the process. Whether or not it can be

Continued on page 134

Safety tools of spark-resistant

AMPCO®

THE METAL WITHOUT EQUAL

Shell Molded with Plenco

to improve casting quality . . . lower production costs

When a spark can mean a hazardous explosion, the bung wrench and hammer-head shown—made of AMPCO metal, a special copper-base alloy—are required for safety considerations.

By shell molding their line of safety tools with Plenco phenolic molding resins, Ampco Metal, Inc., Milwaukee, make substantial gains in both economy and quality:

1. The as-cast condition of the shell-casting is clearly superior to the former green sand casting.
2. Cores are eliminated on the bung wrench; they're now part of the mold.
3. Casting production per man hour is doubled on the wrench using a two-station machine.
4. Yield has increased about 5% due to use of a smaller riser and gating system, and scrap has been reduced considerably.
5. Cleaning costs, also, are considerably reduced.
6. Better detail, sharper corners, and greatly improved overall appearance delivers a far better casting and product to the customer.

Improvement in quality and lowering of cost has made conversion to the modern shell molding method with dependable Plenco resins well worthwhile for Ampco Metal, Inc. Many other foundries have experienced equivalent gains through Plenco shell molding research and engineering. We welcome the challenge of *your* particular problem.

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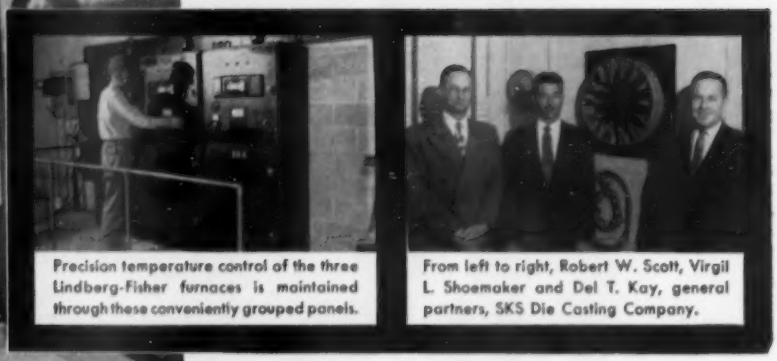

Precision temperature control of the three Lindberg-Fisher furnaces is maintained through these conveniently grouped panels.

From left to right, Robert W. Scott, Virgil L. Shoemaker and Del T. Kay, general partners, SKS Die Casting Company.

"Outstanding Improvement"

IN CASTING METHODS WITH LINDBERG-FISHER INDUCTION FURNACES

● SKS Die Casting Company, Berkeley, California, is engaged in critical close dimensional work in casting fuel cell fittings for aircraft. To achieve consistent results extremely close control of metal temperature is essential.

Mr. Del T. Kay, SKS general partner, says: "We had no previous experience in induction melting and holding and sought the best advice we could find. As a result, we have installed three Lindberg-Fisher two-chamber Induction Melting Furnaces. These fulfilled our requirements completely and represented an *outstanding improvement* over our previous methods."

Like SKS, you will also find that Lindberg-Fisher Induction Melting and Holding Furnaces provide these advantages: cleaner molten metal, continuous production, cooler operation and minimum maintenance. Ask us to recommend the proper type of furnace for your particular needs or write for our Bulletin 560.

LINDBERG-FISHER MELTING FURNACES

LINDBERG ENGINEERING COMPANY, 2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

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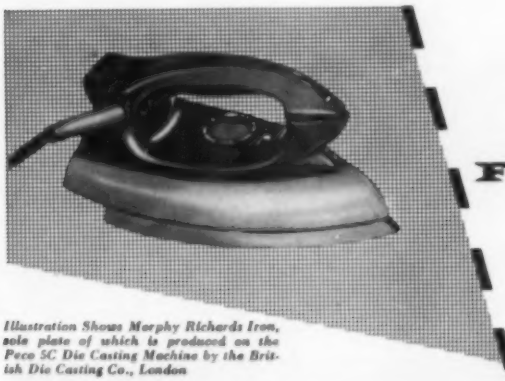


Illustration Shows Murphy Richards Iron, sole plate of which is produced on the Peco 5C Die Casting Machine by the British Die Casting Co., London

FROM ELECTRIC IRONS

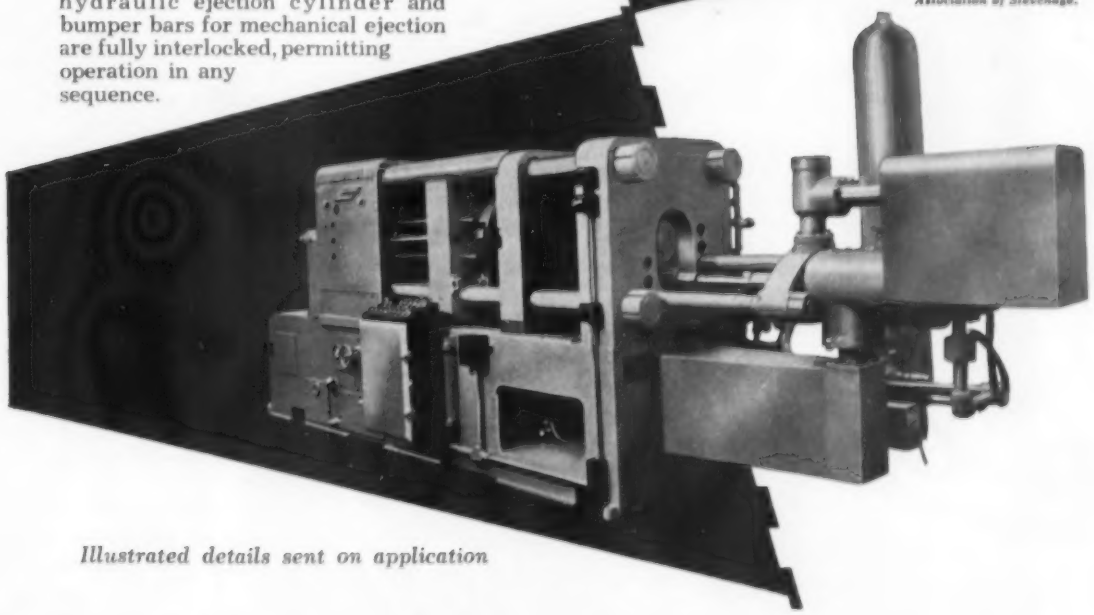
TO SCHOOL DESKS

there's hardly any limit to the types of article being produced on

PECO DIE-CASTERS

PECO machines have completely modernized the technique of Cold Chamber Pressure Die-Casting and with the unique feature of electrical control, they are considerably in advance of other machines on the market. Four core-pulling connections, hydraulic ejection cylinder and bumper bars for mechanical ejection are fully interlocked, permitting operation in any sequence.

Above is an aluminum desk and chair, parts of which are produced on a Peco machine by the Educational Supply Association of Stevenage.



Illustrated details sent on application

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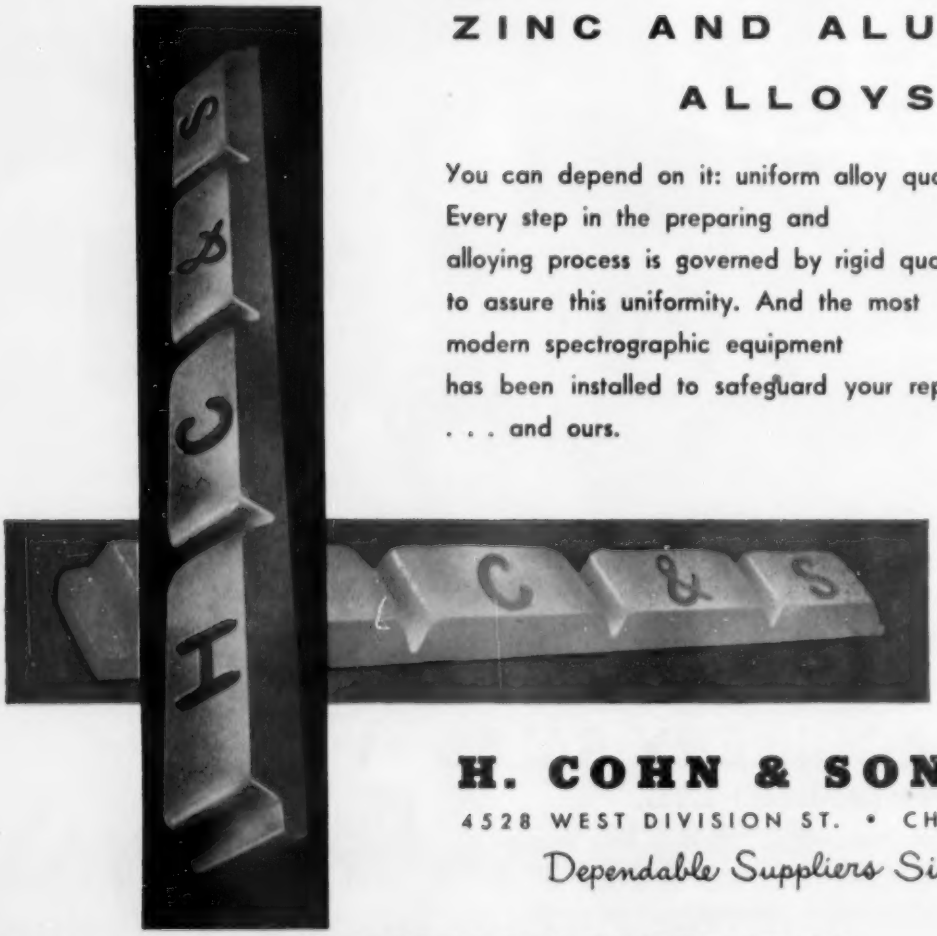

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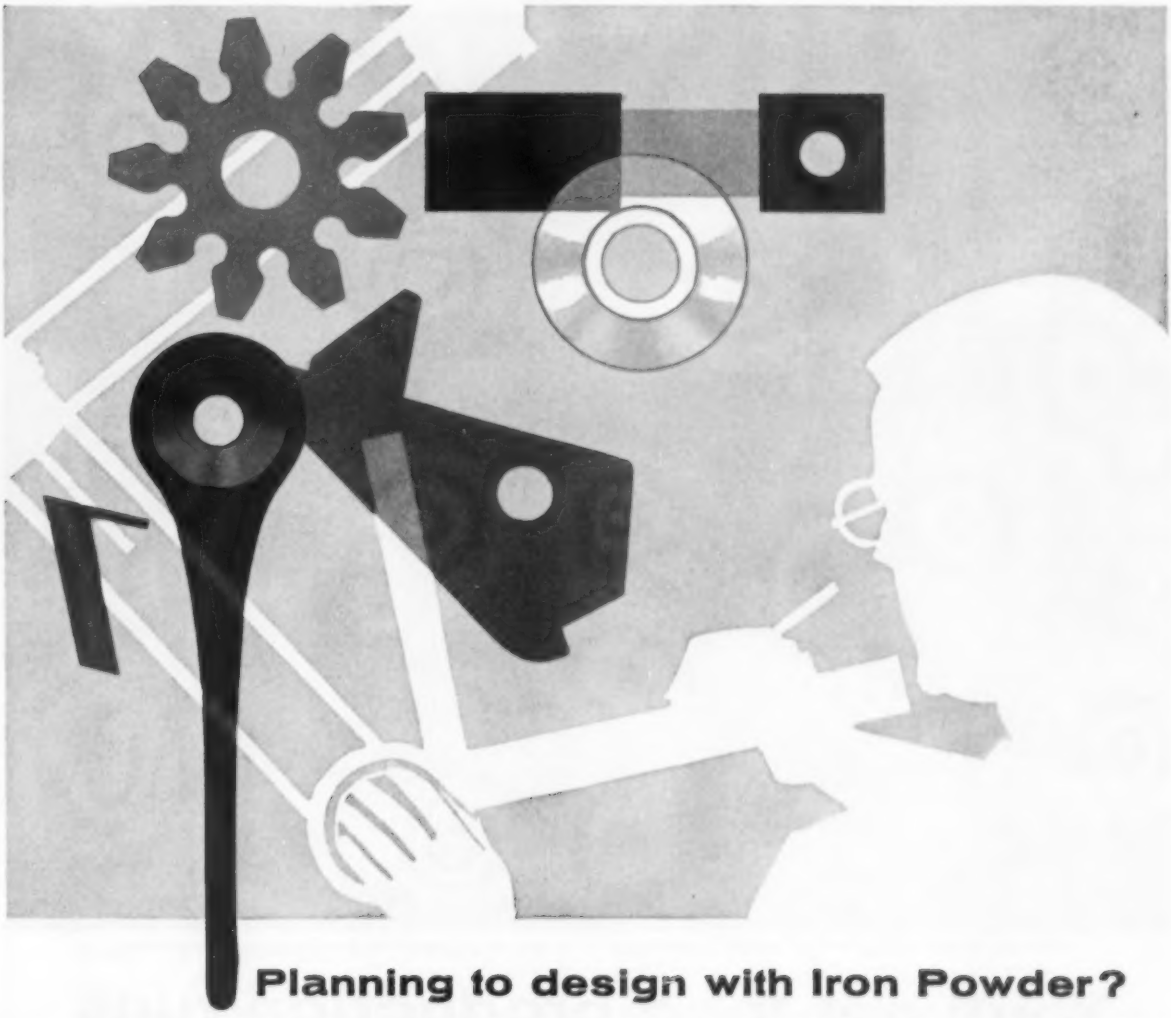

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You can profit from our metallurgical and engineering experience

You can save a lot of headaches when you know the capabilities and limitations of iron powder from the standpoint of design and fabrication—when you know how iron powder will react before you start a production run. And this is where Republic can help you.

Republic metallurgical and engineering service goes beyond just a knowledge of the mechanical and physical properties that can be attained in iron powder parts. Republic specialists can help you determine iron powder's suitability to your parts design, based on the economics of production rates, reduction of metal loss and elimination of machining and finishing costs in comparison to other methods of fabrication.

If Republic Iron Powder does not lend itself to your particular design we will tell you so—and then suggest alternate methods or materials better suited to your particular needs. These recommendations are made without prejudice because Republic produces the world's widest range of bar stock, pig iron and sheets used for machining, forging, casting and stamping.

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Die-casting machine at Doehler-Jarvis Division, National Lead Co., using Cr-Mo-V (High V) die to produce sewing machine part.

You'll get long production runs with Cr-Mo-V (High V)

Whether you are using lead, aluminum or magnesium in your die-casting work, you can be sure of long production runs when you use Cr-Mo-V (High V)—Bethlehem's 5 pct chrome-moly tool steel, with 1 pct vanadium.

Cr-Mo-V (High V) makes possible long die-casting runs because it is a high quality steel with good grain refinement, uniform center density, and freedom from porosity and weak centers. Moreover, it has the stamina to provide outstanding performance when you need it.

Here are other advantages of this fine tool steel. It makes possible dies which, after being polished to a high lustre, impart a smooth, attractive surface to the casting. Cleavage-cracking is no problem at all, provided adequate radii are used in the die, and the steel is properly heat-treated. And because of the higher carbon content, plus high vanadium, there's good resistance to surface-washing and erosion.

Cr-Mo-V (High V) is made by means of a controlled melting procedure, plus adequate forging reduction. In addition, its high quality is assured by means of ultrasonic testing. It's an easy steel to machine because it is annealed to Brinell 217 max. It also responds uniformly to heat-treatment, even in massive sections, producing a uniform hardness of Rockwell C45-47.

If you'd like to give Cr-Mo-V (High V) a workout in your own shop, or to have information about any of our other fine tool steels, just get in touch with your Bethlehem tool steel distributor.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEELS

BETHLEHEM STEEL

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THE V. P. EDISON VOICEWRITER is a masterpiece of decorative and functional design . . . compact, easily handled, embodying every advance in space and weight reduction, without sacrifice of efficiency or serviceability.

This "Eye-appeal" is Cast In by DOLLIN!

Exceptional beauty of form and finish is provided by dense, sound, clean aluminum die-castings without surface imperfections—then buffed to a gleaming finish.

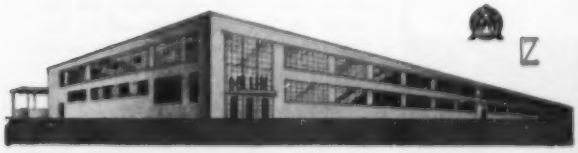
The front control panel is the "show piece" and "work piece" of the V. P. Voicewriter.

REQUIREMENTS: Strength with minimum weight—accuracy of dimensions and fidelity of design—smooth, brilliant natural metal finish.

SOLUTION: Aluminum die-castings by Dollin, delivered to Edison trimmed, ready for final polishing operation. Special surface preparation, plating or lacquering are eliminated. Casting weighs only 6½ ounces.

Like Edison, many other leading manufacturers have discovered that Dollin engineering and techniques get the most out of die-casting designs, at the lowest possible cost. Whether your part is to be of zinc or aluminum—large, small or intricate—consult with Dollin engineers to realize the fullest potential of die-casting economy and quality.

Dollin offers complete facilities, including engineering cooperation—specialized, high-speed equipment—big capacity for mass-production runs—complete die-making department—light machining—assembly work of smaller size in which die-castings are used—fast, dependable service. Send prints or samples for suggestions and quotations.



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DOLLIN Zinc and Aluminum **DIE-CASTINGS**

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PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce, Washington, D. C. for 25¢ each.

AN INVESTMENT MATERIAL to be used as a dip coat consisting of, by weight, about 15% to 30% of an air-setting silicate cement, 35% to 70% silica flour, 15% to 35% water, sodium silicate not in excess of 7%, 0.1% to 0.3% dry wetting agent, 0.1% to 1.0% octyl alcohol, not more than 2% glycerine, 0.1% to 0.4% animal gelatin and an acid not in excess of 0.3%.

Patent No. 2,752,257—Investment Molding—James P. Bradley and Robert R. Dohrmann — assigned to General Motors Corp. — issued June 26, 1956.

A DIP COAT for application to a destructible pattern to be invested in a refractory mold. The dip coat consists of 15 to 30% of an air-setting silica cement, 35 to 70% of silica flour, 15 to 35% of water, sodium silicate not in excess of 7%, 0.1 to 0.3% dry wetting agent, 0.1 to 1.0% octyl alcohol, not more than 2% glycerine, 0.1 to 0.4% animal gelatin and an acid not in excess of 0.3%. All percentages are by weight.

Patent No. 2,752,257—Investment Molding—James P. Bradley—assigned to General Motors Corp.—issued June 26, 1956.

A CENTRIFUGAL CASTING MACHINE having a flask and heating chamber mounted on a horizontal arm which rotates about a vertical axis. The other end of the arm carries a counter balance that is adjustable in position to compensate for different weights of flask and heating chamber. Provision is also made for clamping the flask to the heating chamber.

Patent No. 2,752,650—Centrifugal Casting Machine — Alexander A. Bosna—assigned to J. F. Jelenko & Co., Inc.—issued July 3, 1956.

A METHOD OF MAKING HOLLOW PATTERNS for investment casting which consists of forming an expendable pattern around a refractory core. The contour of the core being the shape desired in the hollow portion of the casting. The expendable material is cast around this core and in contact with a die of the shape desired in the final casting. The die is made in sections in such a manner that the refractory core is partially supported while a part of the expendable pattern material is poured. The supporting die member is then removed and a second die member substituted so that further additions of expendable pattern material can be made to complete the pattern.

Patent No. 2,752,653—Method of and Dies for Forming Hollow Expendable Patterns for Casting—Harold Garton Emblem and Desmond Joseph Cloherty—assigned to Rolls-Royce, Ltd.—issued July 3, 1956.

THE PREPARATION OF METAL POWDERS by hydrometallurgical methods in which the inorganic acid salts of the metals in the group of cadmium, cobalt, copper, nickel and silver are reduced, in solution, by a non-sulfidizing gas at elevated temperatures and pressures.

Reduction conditions, notable hydrogen ion concentration, are so controlled that a seeding precipitate is first obtained. Conditions of hydrogen ion concentration are then changed so that continued reduction takes place with deposition of the metal on the nuclei formed in the first reaction to provide powder densification.

Patent No. 2,753,257 — Hydrometallurgical Production of Metal Powders — Sydney Nasher and Felix Alfred Schaufelberger—assigned to Chemical Construction Corp.—issued July 3, 1956.

Continued on page 42

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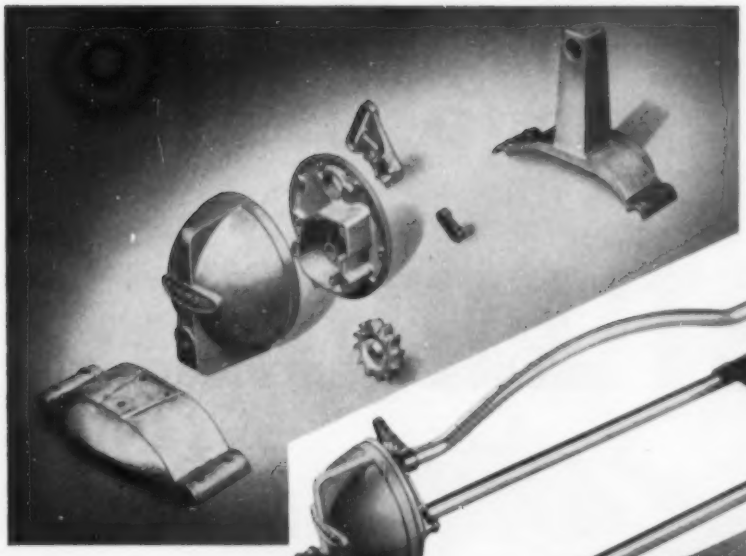


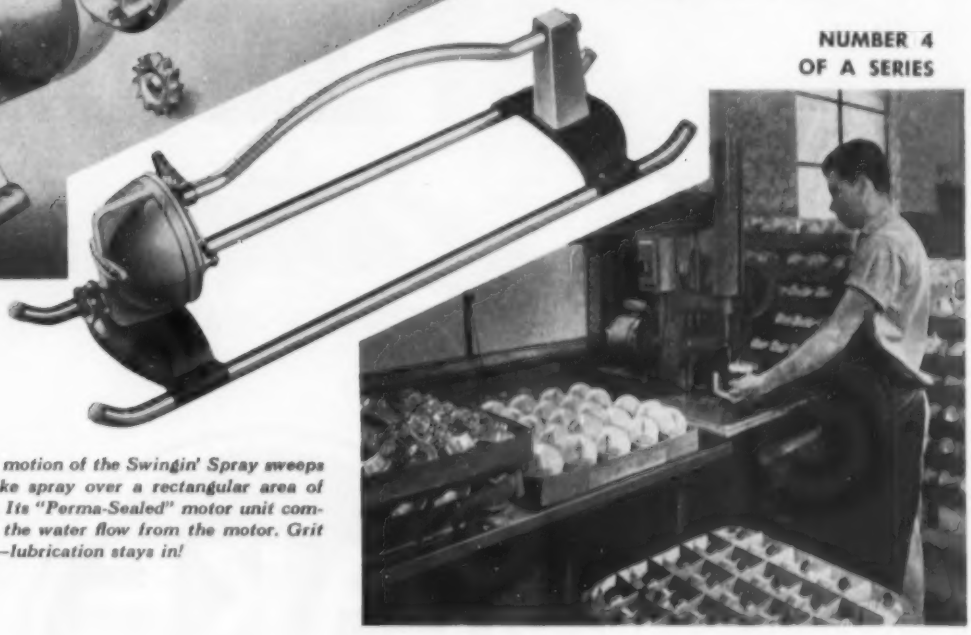
PRODUCTION SHORT CUTS

WITH

ZINC

DIE CASTINGS

NUMBER 4
OF A SERIES



A back and forth motion of the Swingin' Spray sweeps a uniform rain-like spray over a rectangular area of up to 2400 sq. ft. Its "Perma-Sealed" motor unit completely separates the water flow from the motor. Grit and dirt stay out—lubrication stays in!

Covering the ground at MELNOR

Melnor's Swingin' Spray oscillating lawn sprinklers were designed to be sold with a year's unconditional guarantee. This means, of course, that they have been built to high engineering and manufacturing standards. Thus the selection of ZINC Die Castings for seven of the principal assembly components is of special significance.

Because of the unusual contours of the components illustrated, it is obvious that die casting is the most practical method of production. And, when all of the requirements of strength, weight and corrosion resistance were fully considered, Melnor engineers found that ZINC alloy was the metal that would do the job best—at lowest cost. All holes, recesses and projections are obtained in the casting operation, thus greatly minimizing secondary work prior to assembly, and the smooth, as-cast surfaces of four of the parts are easily and economically coated with bright yellow and dark green enamels.

Send for your copy

The production and sales advantages imparted to this motor-driven sprinkler by ZINC Die Castings are typical of those found in a wide variety of products. For 80 additional examples send for our booklet "The End Uses of Zinc Die Castings" and ask any commercial die casting company for die casting design assistance to improve *your* products.

ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front St., New York 38, N. Y.

The research was done and the Zamak die casting alloys were developed with

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

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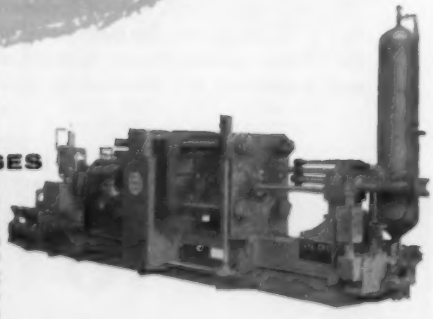
The sign of **QUALITY** in Die Casting Machines

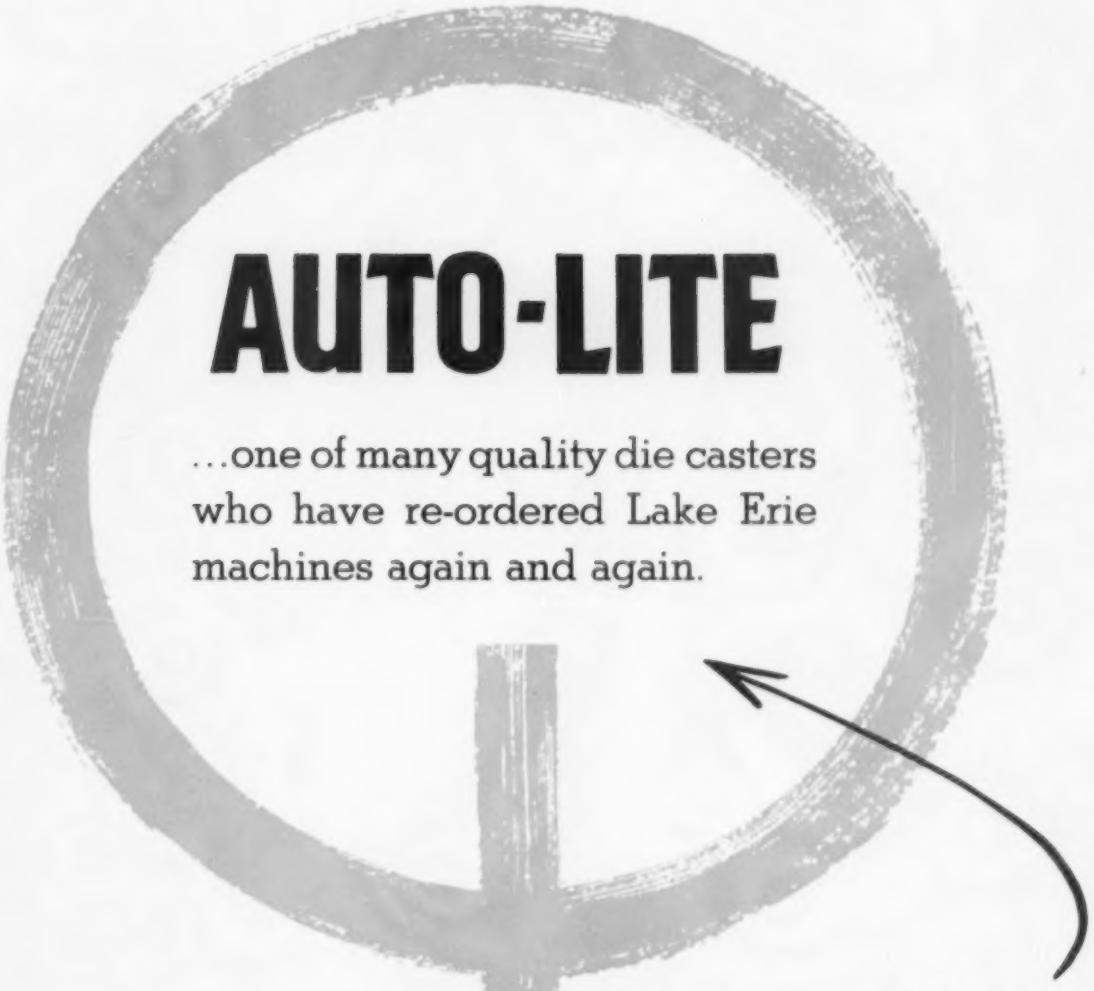
LAKE ERIE

HOT AND COLD CHAMBER MODELS IN ALL TONNAGES



AUTO-LITE

...one of many quality die casters who have re-ordered Lake Erie machines again and again.



The sign of QUALITY die castings produced on 83 Lake Erie machines

"The (Continental) Mark II's grille is made by The Electric Auto-Lite Company, Toledo, Ohio. Ford engineers picked this company because it could maintain the quality standards they were seeking."

STEEL Magazine—May 28, 1956

LAKE ERIE®

LAKE ERIE ENGINEERING CORPORATION, 520 Woodward Ave., Buffalo 17, New York

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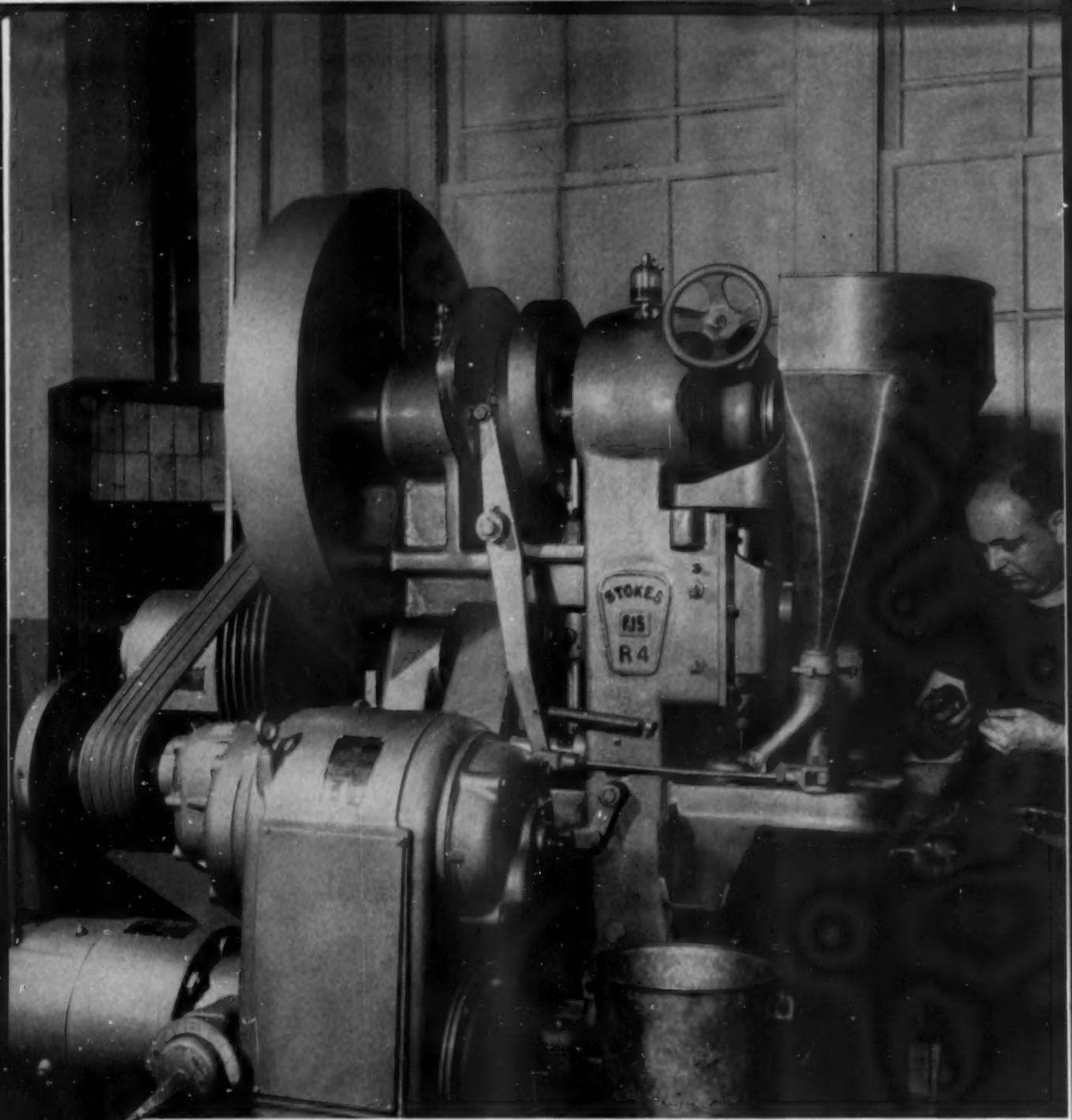


On the Stokes Model R-4 press shown above, Whitney Chain Company produces these parts from sponge iron powder blended with small amounts of copper, graphite and zinc stearate. Tolerances as pressed are less than ±.001" on I.D. and O.D.—and ± .0025" on length.

Powder metal production— on Stokes Press—

up to 200% faster than machining at Whitney Chain Co.

Close tolerance parts are being produced at a rate of 750 to 2000 per hour on a Stokes powder metal press, at Whitney Chain Company, Hartford, Conn. According to Whitney Chain's manager, the same parts would be made at only 450 to 600 per hour by turning from bar stock—an increase in production of 67% to 233% by switching to economical powder metal compacting!

Dimensional tolerances, moreover, are readily held to required limits. On these cylindrical parts, inside and outside diameters are kept within ± .001" *after* sintering . . . length within ± .005".

By using carbide dies and flame-plated core rods, tolerances of parts coming from the press are held well within these values, to reduce the magnitude of the variations that occur during sintering. Stokes press design is especially suitable for the tooling for this kind of close tolerance work.

Pioneering in powder metal pressing, Stokes has led in the development of presses that apply this versatile concept to production of thousands of parts made from metals, alloys, non-metals and mixtures. Stokes fully automatic compacting presses are enabling many manufacturers to reduce labor and machining costs, eliminate waste of metal stock, and often produce properties unobtainable by conventional alloying methods.

From 35 years of Stokes experience in this field come numerous original design features that bring you the best in operating efficiency, ease of set-up and quality of output. The new Model 640 press is the latest in the Stokes line. It affords easy set-up and control, with independent press adjustments and direct-reading calibrations. It is built for high-precision production, with inherent protection against breakage of parts during the critical breakaway and injection operations. Totally enclosed, it runs with maximum safety, needs little maintenance, and handles a wide variety of work.

The Stokes Advisory Service will be glad to consult on your specific powder metal application, and to accurately estimate your anticipated production costs. This consulting service can include laboratory production of sample parts, design and machining of punches and dies, and complete installation and instruction in your own plant. Write today for a consultation, and for the following literature: "Powder Metallurgy Today"; "Stokes Powder Metal Presses"—Catalog No. 801; "Stokes Model 640 Powder Metal Press"—Bulletin No. 670.

Powder Metal Press Division

F. J. STOKES CORPORATION

5526 Tabor Road, Philadelphia 20, Pa.

STOKES

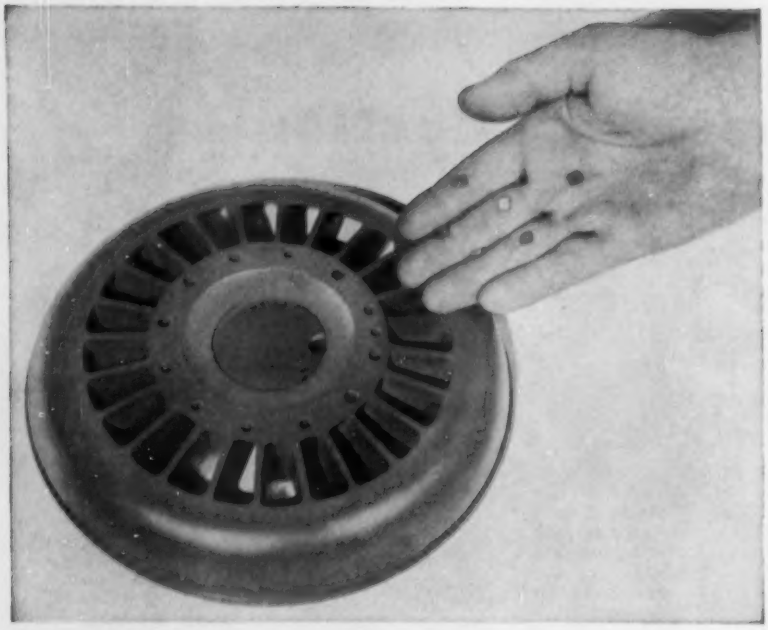
These leading custom producers profit from Stokes powder metal presses

$25,000 yearly saved . . . $30,000 machine tool outlay avoided . . . by making lock parts in a Stokes press at Dixon Sintaloy, Inc., Stamford, Conn.

$20,000 per year cost-reduction was made on a wringer drive gear of iron and copper powder, for use on "Whirlpool" washers. Parts made by the Presmet Corporation, of Worcester, Mass. . . . on Stokes powder metal presses.

82% drop in cost is the story behind this drive gear for a home ice cream freezer . . . formed in a single operation on a Stokes press at Yale & Towne's metal products division, Franklin Park, Illinois.

For more information circle No. 88 on the Reader Service Card



What other process offers such flexibility?

Die casting does so *many* things . . . better!

Take the large vaned pump head above as an example. It's approximately 9" in diameter and weighs 4½ pounds. Then look at the small, four-tooth pinions in the hand. It takes 2100 of them to make a pound. Both units were cast from zinc alloy. Both are accurate to close tolerances.

In each case, designers surrounded the required holes or depressions with a minimum of metal consistent with the requirements of appearance, strength, draft and tolerance. Result: low-cost, accurate parts produced by die casting . . . the process that does so many jobs so well.

If some phase of your production calls for design flexibility, think in terms of die casting. With *any* question, contact Twin City Die Casting Company. Twin City engineers have put their experience to work for hundreds of customers . . . to everyone's satisfaction.

housings?

chassis?

couplers?

...only DIE CASTING can

✓ **cut your costs**

✓ **offer such flexibility**

✓ **provide such accuracy**

FOR PROOF... CALL, WRITE OR WIRE:

TWIN CITY DIE CASTINGS CO.

3351 TALMAGE AVENUE S. E. • MINNEAPOLIS 14, MINNESOTA

TELEPHONE MIDWAY 6-7528

For more information circle No. 93 on the Reader Service Card

PATENTS

continued from page 36

A PERMEABLE GYPSUM PLASTER MOLD containing fully hydrated gypsum as the principal component. The mold having interconnected air bubbles, each bubble having a diameter not exceeding 0.020. The bubbles are uniformly distributed throughout the mold body and perforating the external surface of it. This mold is characterized by a permeability exceeding 20 on the A.F.S. scale and by a compressive strength of at least 50 psi.

Patent No. 2,754,220—George R. Gardner—assigned to Aluminum Co. of America—Permeable Plaster Mold—issued July 10, 1956.

SMOOTH SURFACE SHELL MOLDS are made from a mixture of refractory filler material, a thermplastic, lignin type, resinous material derived from wood and containing both methoxyl and hydroxyl groups and a thermosetting binder. The mold material is placed in contact with a heated metal pattern so that a thin smooth-surfaced layer of the mixture is formed adjacent to the pattern. Then curing the mold and removing it from the pattern.

Patent No. 2,751,650—High Strength Shell Molds—Charles F. Froberger—assigned to General Motors Corp.—issued June 26, 1956.

A METHOD OF PRODUCING METAL POWDERS of the group composed of uranium, tungsten, titanium, zirconium, vanadium, thorium and columbium. The pure halide salt of the metal is reacted with calcium hydride and a sodium halide at a temperature between 100C and the fusion point of the metal halide. The calcium hydride is added in sufficient quantities to provide an excess of from 5% to 15% in excess of that theoretically required.

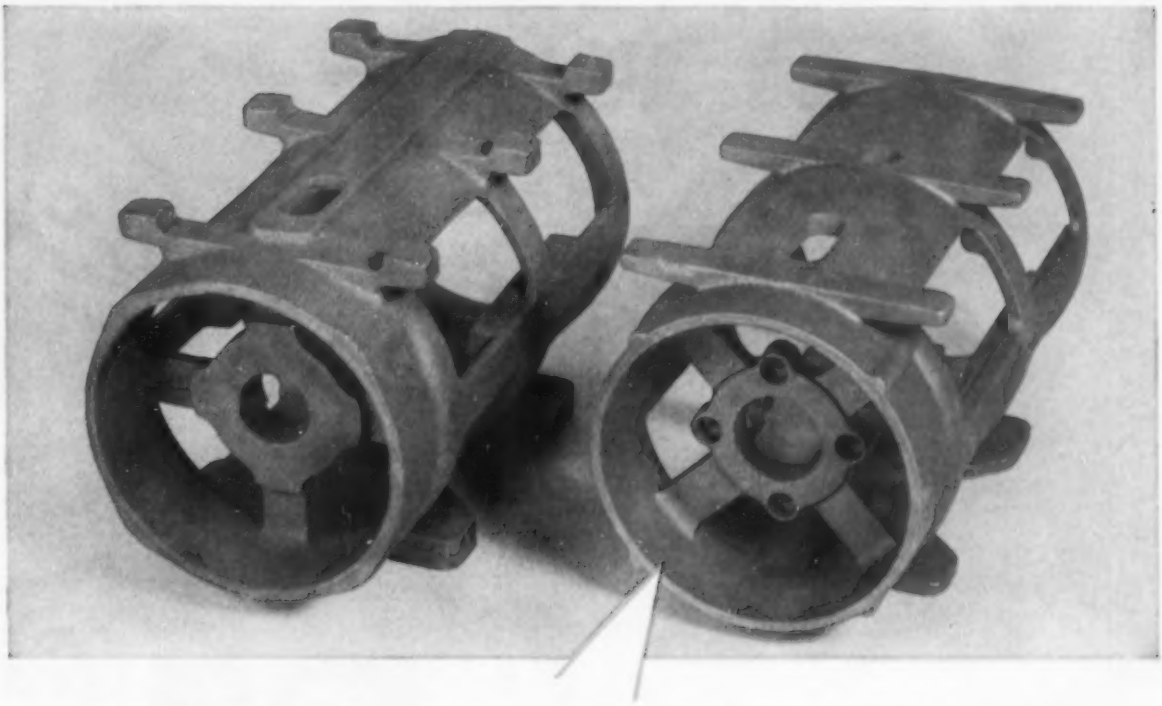
Heating is carried out slightly above atmospheric pressure and for sufficient time to secure complete decomposition of the metal halide to the metal hydride. The reaction product is then heated in an inert atmosphere at a pressure slightly above atmospheric and a temperature above the fusion temperature of the halide mixture. This permits the residual calcium hydride to react with oxides present to form calcium oxide.

After the fusion treatment, the reaction product is heated at reduced pressure to decompose the metal hydrides formed and in some cases to affect a grain growth.

Patent No. 2,753,255—Method for Producing Powders of Metals and Metal Hydrides—Peter P. Alexander and Robert C. Wade—assigned to Metal Hydrides, Inc.—issued July 3, 1956.

SAND . . PLASTER . . SHELL . . DIE . . OR PERMANENT MOLD?

Experience tells which casting method is BEST!



THIS CASTING COST 92.7% LESS ...AND IS A BETTER CASTING!

Because Bendix Foundries are proficient in *all* types of casting techniques, we can employ whatever method will get the job done *best* . . . and *at least cost.*

Maybe *your* castings are costing you too much—costing you too much in excessive weight . . . in extra machining . . . or in other penalties that pile up when you use anything but the one best casting method for the job.

Take the case of the magnesium generator housing castings above. The one on the left was produced by sand casting. The one on the right by die casting . . . which was the recommendation of Bendix Foundries after a cost reduction study program.

The result of using die casting was a 95% saving to the customer in the cost of the casting alone . . . a 59% saving in time spent machining the rough casting . . . a substantial saving in weight and metal . . . and an over-all saving to the customer of 92.7%.

This is a typical example of how Bendix Foundries can save their customers time and money . . . and, at the same time, provide them with *better* castings.

To find out what we can do for you, write BENDIX FOUNDRIES, BENDIX AVIATION CORPORATION, TETERBORO, NEW JERSEY.

West Coast Office: 117 E. Providencia Ave., Burbank, Calif.
Export Sales and Service: Bendix International Division, 205 E. 42nd Street, New York 17, N. Y.

Processes & metals used by Bendix Foundries

	ALUMINUM	MAGNESIUM
Sand	Yes	Yes
Plaster	Yes	Yes
Shell Mold	Yes	Yes
Die	Yes	Yes
Permanent Mold	Yes	Yes

BENDIX FOUNDRIES

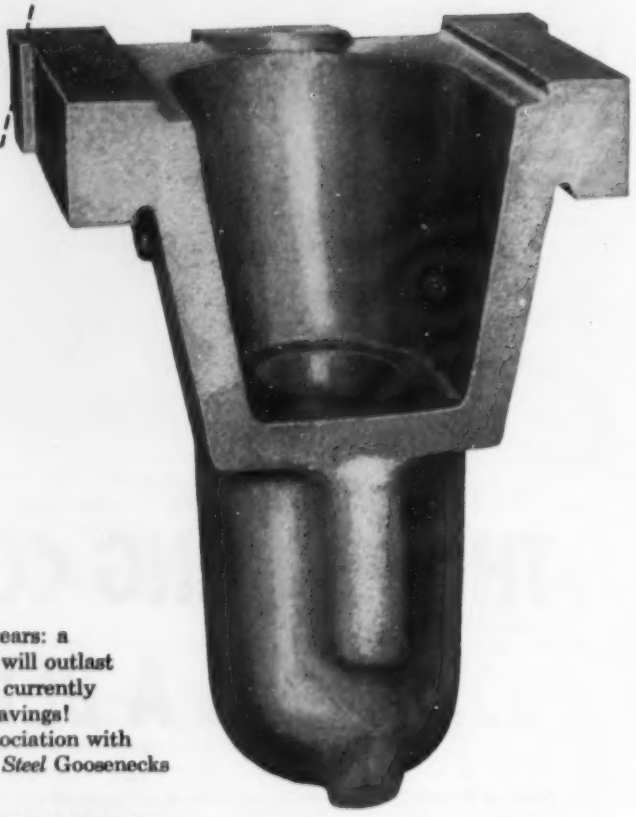
Bendix AVIATION CORPORATION

For more information circle No. 18 on the Reader Service Card

Dodge Custom-made **Special Alloy Steel Goosenecks**

for longer service life

less maintenance



■ **Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available . . . and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:**

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy steel, they prevent cracking . . . bottom breakout . . . spout erosion.

Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks. Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DS

DODGE STEEL COMPANY

Finished Products Division

6501 Tacony Street • Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

For more information circle No. 35 on the Reader Service Card

ratchet for file cabinet shown about twice actual size

how this YALE powdered metal part solved a very important cost problem:

The problem was simple, but the answer wasn't.

The company made filing cabinets. Each drawer used two of the parts shown above. And thousands of filing cabinets meant hundreds of thousands of these parts.

The problem: How to produce the part—with the extra strength and close tolerances needed because of its unusual shape—without its cost becoming prohibitive.

A YALE* powdered metal part was the happy solution. The irregular shape was no obstacle because of the flexibility of powder metallurgy.

And YALE engineers, working closely with the manufacturer, performed the metallurgical magic that solved the rest of the problems.

Final results? Tensile strength: more than adequate. Cost: appreciably lower than similar machined parts. Performance: better than required. Delivery: on schedule, and in the large quantities necessary.

Perhaps you have a problem a YALE powdered metal part can solve. Our engineers are as close as your telephone whenever you'd like to talk about it.

*REG. U.S. PAT. OFF.

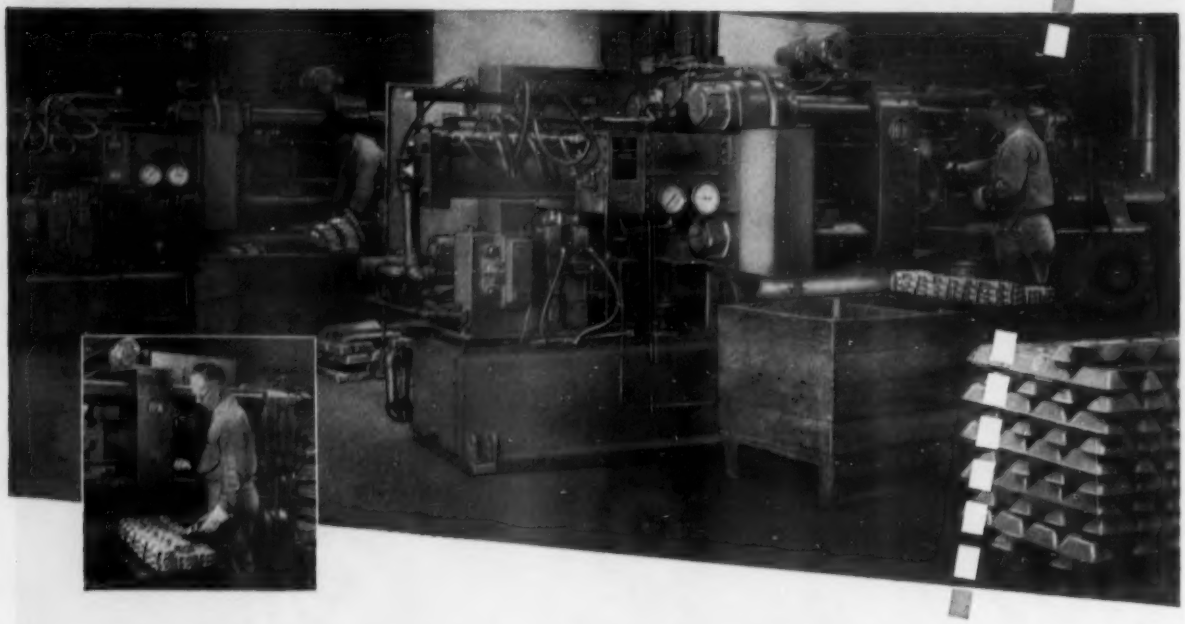
powdered metal parts

YALE & TOWNE

THE YALE & TOWNE MANUFACTURING COMPANY, POWDERED METAL PRODUCTS DIVISION, 9335 BELMONT AVENUE, FRANKLIN PARK, ILLINOIS

For more information circle No. 96 on the Reader Service Card

PRESSURE-TIGHT CASTINGS

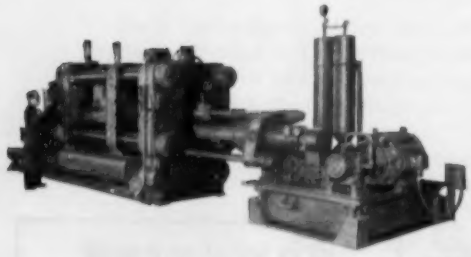


H-P-M Die Casting Machine "Locks Up Tight" For Valve Bodies of Consistent Density

When this H-P-M Die Casting Machine closes the two-cavity mold and metal is shot into intricate dies, each having cores on full three sides, the superior features of H-P-M's mechanical link wedge closing mechanism are convincingly tested. Mr. W. L. Chapman, President of The W. L. Chapman Co., Pasadena, Calif., one of the West Coast's most rapidly expanding die casting operations, says:

"These valve bodies have intricate coring detail on all sides and it takes a machine that locks up tight to produce leakproof, pressure-tight castings. One by one we are replacing all machines in our shop with H-P-Ms. We have two in operation and another on order."

Have you investigated thoroughly the production advantages of the new H-P-M Die Casting Machines? You won't have to pass up the tough jobs. Put them on an H-P-M . . . profitably!



If you have a tendency to back away from the tough ones, take a look at the new H-P-Ms. They're built to produce to the most exacting demands of you or your customer.

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.
A DIVISION OF KOEHRING COMPANY

HPM

For more information circle No. 52 on the Reader Service Card

"Prohibitively Expensive"
...until Inco precision cast it

"How in the world do you expect me to machine this?" asked the chief machinist as he held up this tiny part to examine it more closely. "It's hard enough to cut glass!"

"That's right, George," said the engineer. "It's got a Brinell of 600."

"It'll cost a small fortune if I machine these out of bar stock. Why has it got to be so darn hard?"

"Because if we make this stem tip out of the metal we regularly use in our valves, it won't give the required service," said the engineer. "You see, George, this is the only metal we've found that won't gall and score in our valves when they're handling raw crude oil and hydrogen sulfide at 6,000 psi and 525°F."

"But we'll go broke machining them," said George, shaking his head.

"That's the good news," said the engineer. "International Nickel is going to precision cast them for us. When you get these stem tips they'll be just like the one you're holding there."

"Why didn't you say so? There'll be nothing to it then," said George. "All this needs is a little smoothing before we mount it on the stem."

That is why Kerotest Manufacturing Company has Inco precision cast the stem tips for their needle valves when they are to be used in extremely corrosive service.

How to cut costs with INCO *precision casting*

Wherever you have a part which is 6 inches x 5 inches or smaller, weighs under 3 lbs., requires starting tolerances as close as plus or minus .005 inch per linear inch, and needs 5 or more fabrication steps, there's a good chance you can save by having it precision cast.

5 Advantages of INCO *Precision Castings*

- Save up to 60% of production costs.
- Longer life with harder alloys.
- Little or no machining required.
- Wider design latitude.
- Higher alloys at lower cost.

INCO precision casts most high-melting-point metals from carbon steel to the new super alloys.

Here's help for you

If you have a cost problem with a small part, send for the new 16-page booklet on Inco casting that's just out. It's called *Cast to Outlast*. And it gives you actual case histories of the success others have had with Inco precision castings. Successes like Kerotest's . . . successes in a wide number of fields that may suggest how you can cut your costs with Inco precision castings.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

Inco Castings . . . ***Precision, Sand, Centrifugal***

For more information circle No. 57 on the Reader Service Card

60,000 SQUARE FEET OF MODERN FACILITIES

Suppliers to:

A. C. Gilbert

Bridgeport Brass

Casco Products

Caterpillar Tractor

C. B. S. Columbia

Chase Brass

Cuno Engineering

Emerson Radio

General Electric
Bridgeport, Conn.
Lynn, Mass.
Brockport, N. Y.
Louisville, Ky.
Providence, R. I.
Somersworth, N. H.

General Motors

Gilbert & Barker Mfg. Co.

Greist Mfg.

Remington Rand

Royal Typewriter

Scovill Mfg.

Stanley Works

Western Electric
Baltimore, Md. Kearny, N. J. Haverhill, Mass.

Westinghouse

Whitney Blake

and others...

Such patronage must be deserved

THE NEW ENGLAND DIE CASTING CO.

445 Front Ave. West Haven, Conn. • P. O. Box 1281 New Haven, Conn.

Forecast: die casting use will grow 35% within next four years

GROWING use of die castings is an inevitable consequence of present trends in American manufacturing . . . with climbing wage rates and sluggish gains in productivity per man hour, industry must turn to every possible means of cutting the labor content of their products. Die casting is one of the best and most effective ways of eliminating costly hand work.

According to the Bureau of Labor Statistics, wages were up 300 percent between 1939 and 1955 . . . but productivity per man hour climbed only 28 percent. This trend forces manufacturers to turn to die castings for many parts now being made by less economical methods. Die casting has aptly been called "the shortest route from raw material to finished components".

Taking into account possible leveling off or reduction in automotive sales, and figuring also the possibilities inherent in some major new use for die castings as a result of technological advancements, it looks as though the 1960 shipments of die castings should be up between 35 and 40 percent over 1955's record totals.

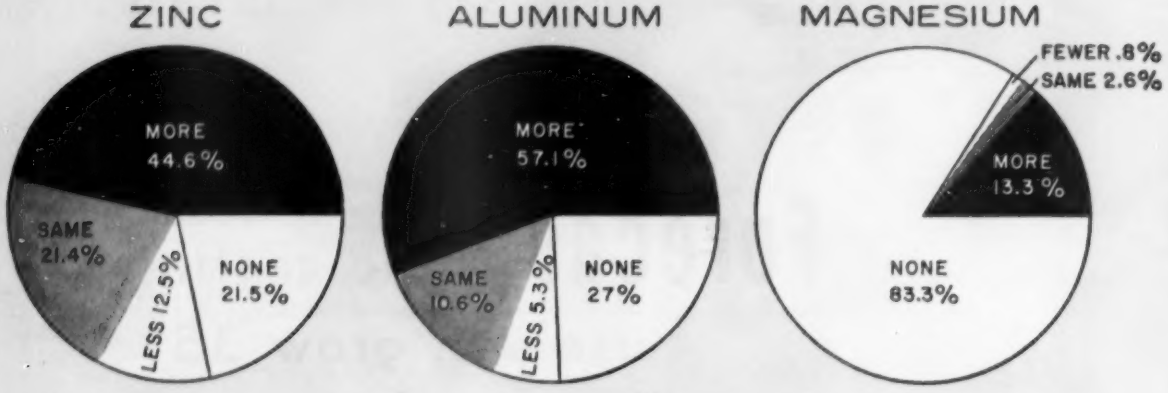
To gain an insight into future trends the editors of PMM contacted designers, buyers and producers of die castings, as well as producers of metals, alloys, machines and equipment for die casting. What was learned is presented on the following pages devoted to . . .

the factors that govern future applications:

50 **Design planning**
55 **Die casters' viewpoint**
57 **Metals and alloys**
59 **Technological developments**
61 **Die casting machines**

For more information circle No. 76 on the Reader Service Card

MANUFACTURERS SAY THEY'LL USE MORE DIE CASTINGS IN ALL ALLOYS . . .



BIGGEST ADVANCE in die casting practice, many designers say, has been the ADCI's Certified Zinc Alloy plan. This may account for part of the increased usage of zinc die castings in tomorrow's products.

MOST NEW APPLICATIONS are indicated for aluminum die castings. By 1961, these light metal castings will be found in many products which do not now include them. 67.7% will use as many or more.

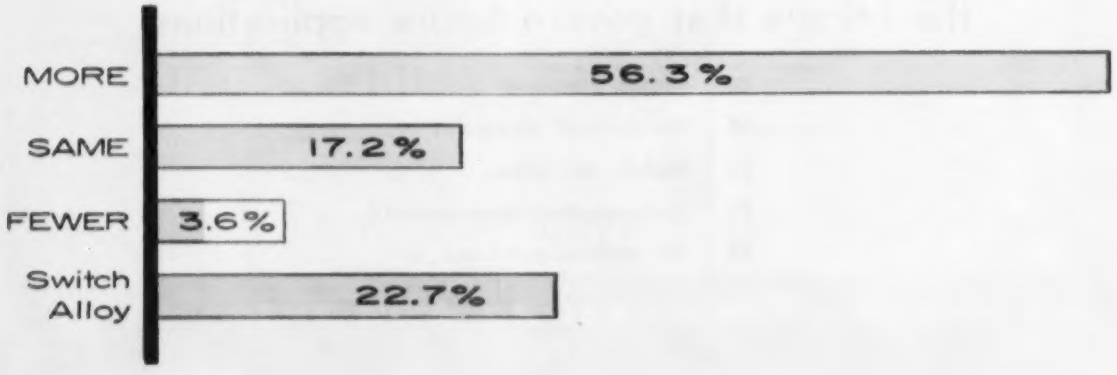
DESPITE PRICE RISE, which has killed off many current plans to introduce magnesium die castings, the long range view shows that 13.3% more products will include magnesium die castings by 1961.

pmm

DIE CASTING FORECAST ISSUE

Peak Years For Die Casting

IMPORTANT CHANGES ARE IN THE WIND, since only 17.2 percent of those now using die castings expect their usage to remain at present levels five years from now. Most of them expect to increase their over-all usage, and a substantial group will shift the major emphasis from one alloy to another, as is indicated by this bar graph . . .



IN THESE PRODUCTS BY 1961 . . .

More Zinc Die Castings

Home appliances
Automobiles
Control devices
Electric motors
Hardware
Water heaters
Space heaters
Sporting goods
Gas engines
Instruments
Communications
Photo equipment
Portable tools
Sewing machines
Novelties
Electronic units
Materials handling equipment
Utilities equipment
Business machines
Vending machines

More Aluminum Die Castings

Home appliances
Automobiles
Control devices
Gas engines
Photo equipment
Aircraft
Business machines
Hardware
Speed reducers
Testing devices
Gas valves
Hydraulic units
Instruments, gauges
Sewing machines
Air conditioners
Tractors
TV and radio
Gas meters
Portable tools
Heating equipment
Electronic devices
Microphones
Industrial equipment
Elevators and escalators
Machine tools
Electric motors

More Magnesium Die Castings

Aircraft
Automobiles
Business machines
Home appliances
Electromechanical equipment
Portable tools
Controls
Electronic equipment
Communications

Are Still Ahead

An indicated increase in all non-automotive uses of die castings during the next five years may be the key to continued growth for the die casting industry.

THE men who should know . . . the designers and engineers who are working on their companies' new product development . . . say they'll be using more die castings in 1961 than they do this year.

These men, representing industries of all types that employ metal components in their products, indicated a definite trend toward the use of die castings, in reply to a survey questionnaire sent out by the editors of PMM during July.

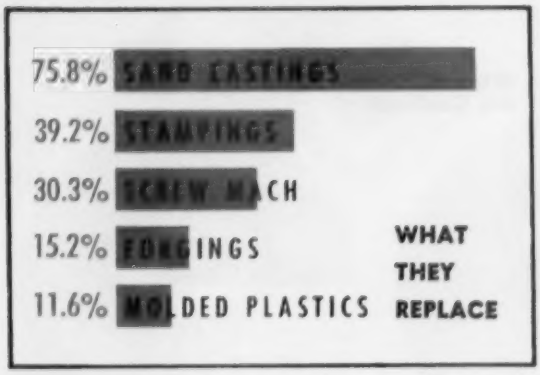
Of 274 men concerned with design and procurement who responded to the questionnaire, 56.3 percent said they expect their products to use more die castings by 1961 while 17.2 percent indicated that their usage would be about the same as at present. Another 22.7 percent will continue their use of die castings at about current levels, *but will make a shift in major alloy.*

Who are these engineers? They were chosen on a widespread geographical basis, from coast to coast, in industries ranging from agricultural implements to toys, from automobiles to water meters, and from appliances to weaving machines. Of those who answered the questionnaire, 81.7 percent now employ die cast parts in their products.

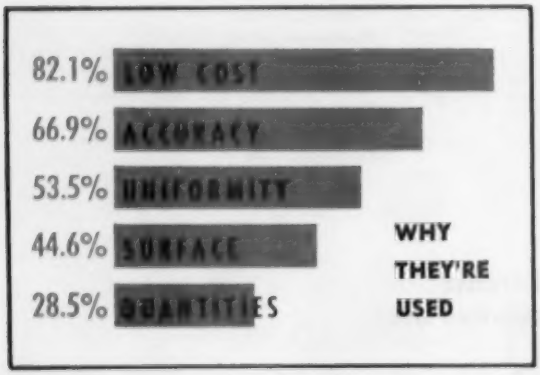
Diversity of products in which die castings are due for a boost is one of the most impressive features of the survey findings. While automotive and household appliances lead the field, as might be expected, there are strong indications of increased interest in die castings by manufacturers of all types of control devices, instruments, hardware items, communications equipment, business machines, heating and air conditioning products, aircraft, and special machines. An over-all list of products whose manufacturers say they will use more zinc, aluminum or magnesium die castings in the foreseeable future, is tabulated above.

Although not a specific indication of relative tonnages of castings, aluminum appears to be catching up with zinc in the *total number of applications.* It is impossible to predict whether any of the new applications will have an appreciable effect upon the volume of alloy consumed, comparable to the tremendous impact which the acceptance of the automatic transmis-

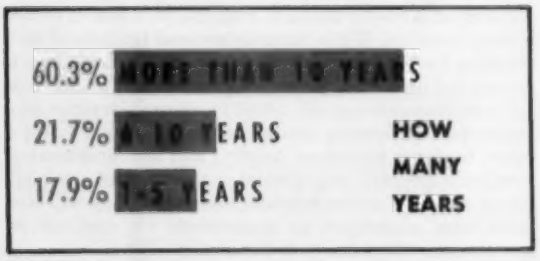
How present users evaluate die castings in their products



FAR AND AWAY the biggest rate of conversion is from sandcasting to die casting. Why? The rising cost of skilled labor needed to machine, polish and otherwise finish rough castings. Most of these surfaces can be used without heavy reworking when they are die cast.



THE DOLLAR SIGN still dominates the picture when designers are choosing a manufacturing method. This is not news, but the fact that 82.1 percent of the engineers in this survey rated lower costs as their prime reason for using die castings speaks well for the economy of die casting.



MANY NEWCOMERS are indicated among those using die castings. A healthy 17.9 percent say they have bought their first die castings within the past five years. Most companies that use die castings, continue to do so in subsequent redesigns, as is evidenced by the fact that the majority have been using die castings more than ten years.

sion has had upon the sale of aluminum die castings.

Those who predict the same or greater usage of aluminum die casting in their products total 68.7 percent of those replying, while those who expect to use the same or more zinc die castings total 66.0 percent. However, increased usage accounts for 57.1 percent of the aluminum die castings and only 44.6 percent of the zinc die castings.

Magnesium, which now is chosen for only a very small portion of the total number of die castings, also appears headed for new design applications, principally in the aircraft, automotive and appliance fields. Out of all replying to the questionnaire, 13.3 indicated new uses for the magnesium alloys.

Major advances: New machines and Certified Zinc plan

Asked what they consider the most important advances that the die casting industry has made during recent years to contribute to greater usage of die castings, the two principal answers were:

- Larger and higher-pressure die casting machines capable of producing larger, more intricate and better quality castings.
- The Certified Zinc Alloy Plan introduced by the American Die Casting Institute.

Improved quality control to reduce porosity and "cold flow" characteristics was pointed out by a manufacturer of electric motor controls as the most important advance his company has noted while a manufacturer of lighting fixtures indicated that great advances in tooling know-how provides wider latitude in product design.

An electronic equipment company reported vacuum die castings to be the most important forward step of the industry, while a large number felt that accuracy standards have been improved, and the die caster is now able to hold tolerances that would have been impossible a few years ago.

It is interesting to note that majority of comments on advances in die casting center about the improved techniques and ability of the die casting shop, while relatively few made mention of specific technical advances in equipment, aside from general comments on larger machines.

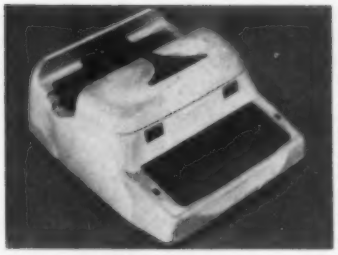
Other items getting one or two comments apiece were: improved die steels giving longer tool life and superior surface quality castings; new alloys with desirable engineering properties; lower cost castings.

Major complaint: Reduce die costs

To get the other side of the picture, PMM asked, "What could the vendors of die castings do to help you use die castings more effectively?" The main outcry: "Reduce die costs!" The initial investment in tooling, which has long been recognized as a deterrent to the use of die castings, particularly in the low-to-medium quantity range, has been the subject of considerable study by the die casters and their suppliers. As yet, no substitute for spending many hours of skilled engineering and tool-making time working with high quality steel has been found. In the eyes of today's users, at least, this should be the prime target for industry research to lower the cost of dies.

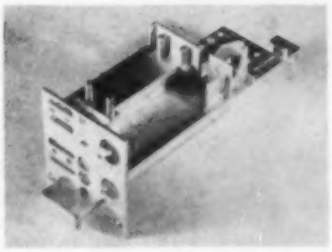
Calls for reduction of porosity in critical sections were voiced by engineers working in the design of appliances, internal combustion engines, electrical con-

Continued on page 106



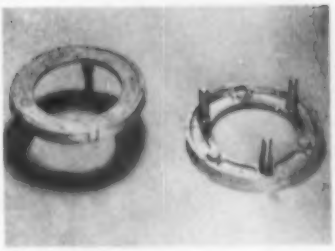
Mt. Vernon Die Casting Co.

OFFICE MACHINES



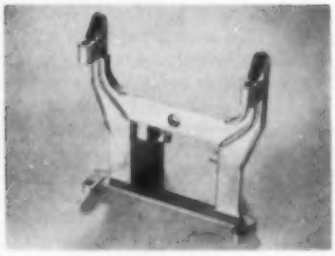
New England Die Casting Co.

COMMUNICATIONS



Hanson Aluminum Mfg. Co.

TRANSPORTATION



New England Die Casting Co.

SPECIAL MACHINES

LEADERS: they're big users today . . . but what are their plans for 1961?

Orlis Rapendiner Corp.

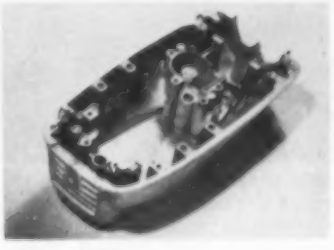
TOYS, NOVELTIES

New England Die Casting Co.

AUTOMOTIVE PARTS

Paramount Die Casting Co.

HEATING, HARDWARE



New England Die Casting Co.

APPLIANCES

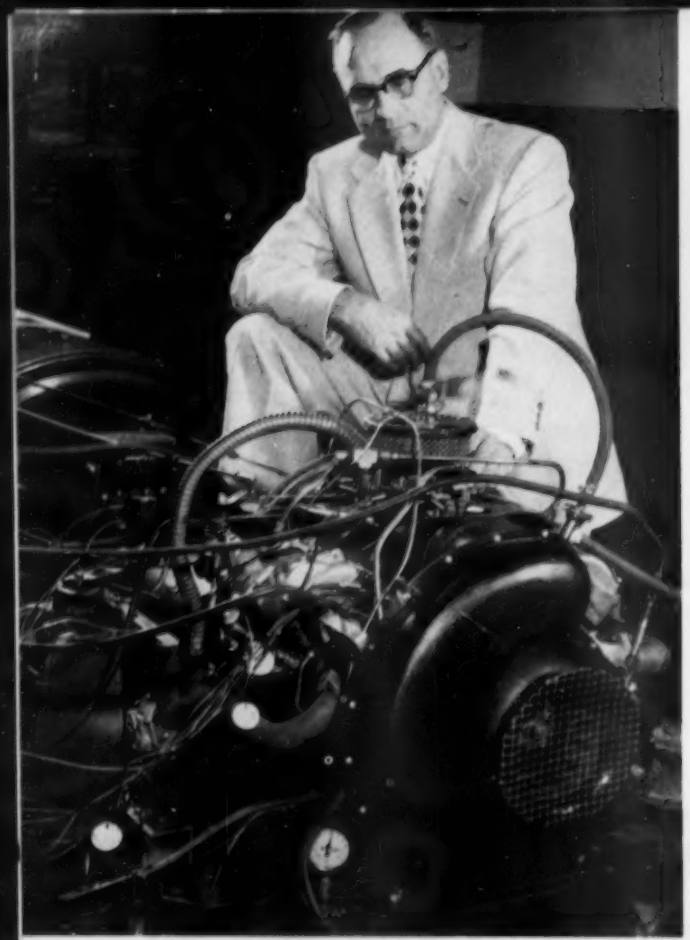
Users' Views: greater usage linked to lower costs, better looks

IMMEDIATE PROSPECT: There'll be more die cast parts in 1957 autos thanks to more chrome plated trim, more automatic transmissions, more optional gadgets. Buick says it will use 5 percent more die castings. Household appliances, too, will use more die castings per unit and may hit new records for sales. One of the biggest manufacturers of a complete line of domestic appliances expects 1956 to be 4 to 5 percent ahead of the 1955 peak year. Business machines are headed for new sales levels. With all this ahead, PMM has asked some leading engineers for the long range prospects for the use of die castings in their products.

W. E. CRINK, Chief Engineer
Addressograph-Multigraph Corporation

"Our consumption of die castings will probably be up a little next year. In general, we will use both zinc and aluminum base castings, but zinc would be the great majority. Our present planning indicates that many of the castings we will buy will be the same as in the past years, but there are some entirely new ones coming up as well as some redesigned older parts."

"For our purposes, die casting offers only the advantage of lower costs. Where a die cast part can be



NEW USES COMING UP include this radically new air-cooled V-4 engine from American Motors Corp. Die castings play an important part in its design. Says Dana K. Badertscher, chief engineer, Transportation Equipment, "The crankcase, 4-cylinder barrels, 2-cylinder heads, 2-cylinder head covers and the timing gear are all die cast aluminum. Not only will die casting reduce the over-all weight of the engine, but it will also provide certain surfaces that need not be machined which otherwise would have to be. With die casting we get a denser structure; therefore, we can use thinner walls without sacrificing strength."

USERS' VIEWS—continued

used and where the volume is high enough, we switch to die castings if the price is right."
"As a general rule, we have found that the castings, as delivered, are quite satisfactory, though we would like to see faster delivery."

G. O. PAUL, Design Engineer
Sargent and Greenleaf Co.

". . . we expect that our use of die castings will continue at about its present level. If general business conditions improve, then we will, of course, use more die castings. We use mostly zinc base castings and our use, while influenced somewhat by appearance, is dictated mostly by function. We have found that function and cost go almost hand-in-hand and for that reason we are going more and more to die castings."
". . . as far as the effect of automation on our use of die castings is concerned, we find that the greater the degree of automation the more die castings we make. This is true, of course, because we turn out more products. Also by casting the parts in zinc so that we can accomplish operations by automation we have, in some cases, almost eliminated handling and the handling is a big item."

H. R. RILEY, JR., Chief Development Engineer
The Black & Decker Mfg. Company

". . . here at Black & Decker, we use mostly aluminum die castings for housings, handles, etc. There are a few zinc castings used, but to my knowledge, no magnesium die castings. Our use is dictated almost entirely by cost and eye appeal. In other words, if all other things are equal, we will use die castings because a better appearance can be achieved."
". . . occasionally, there are problems with the castings. Generally, they are associated with surface porosity, but this is only occasional and is usually fairly easily corrected. Our castings come with very nice surface."
". . . generally speaking, we prefer to do our own machining, both to keep our shop busy and because most of our suppliers can only do certain jobs, not the overall machining necessary. Our experience is such that we use die castings wherever possible. The suppliers have done an excellent job and, when asked, have gone all out to give us earlier deliveries, samples, and that sort of thing. That's why our use of die castings is continually increasing and will probably continue to do so."

"... the economy of die castings makes our products available to a larger potential market."

KARL R. STRAUSS, Chief Engineer, Elmira Plant
Remington Rand Div. of Sperry Rand Corp.

". . . Our business machine production schedules depend to a considerable extent upon the use of die castings. Their versatility has found application in our portable, standard, and electric typewriters, as well as in our calculators, accounting machines, and many other products which we manufacture."
"Whether in the office or the home, quality of our products both in appearance and performance is extremely essential. In this respect we are greatly assisted by the uniformity and surface finish which these castings permit."
"Taking full advantage of the ability to cast intricate surfaces, this modern production method has reduced machining operations to only such locations as require very close tolerances. The ability to obtain castings having thin wall sections has also been of importance in product design. Where light weight is a factor aluminum die castings are being utilized in the fullest extent to replace heavier alternate designs.
"The economy of die castings has also been beneficial in making our products available to a larger potential market. For the future with experience gained in many applications, the prediction is a continual growing demand for the use of die castings both in our present machines and in newly designed products."

Continued on page 107

Producers' Views: die casters getting ready for the best year yet.

WITH 1957 SHAPING UP into one of the best years in the history of the die casting industry, the opinions of several jobbing die casters are presented here, commenting on new developments which may affect their industry. Stepped-up activity is reported from all areas, with the promise of still greater expansion depending upon new technological developments.

CLARENCE OMANN, President
Advance Tool & Die Casting Company

". . . One development to watch is vacuum die casting."

". . . as far as 1957 is concerned, we expect it to be at least equal to 1955 and possibly exceed it a little as far as production is concerned. The one development that will bear close watching is vacuum die casting. While I have little personal experience with this process, from what I can learn, it has a large potential."

". . . there is still a distinct tendency for designers to over-design their components. By that I mean that they call for close tolerances where they are unnecessary, install too rigid an inspection system and specify alloy types that give no advantage and increase the cost of the castings. By consultation with the die caster, many of these factors could be modified so that the purchaser would receive a completely functional casting, but at a much lower cost than is now the case when they demand rigid adherance to unrealistic drawings and specifications."

LEWIS TURNER, Vice President
The Dollin Corporation

". . . Look for more technological advances in the next five years."

". . . I rather expect that 1957 will at least equal 1955 and 1956, but in all probability there will be a shift away from zinc and toward aluminum. Technologically, the die casting industry should show a more rapid development in the next five years than it showed in the past five years. Progress in the recent past has been rather slow and should accelerate considerably."

". . . die castings seem to be becoming both larger and more intricate; this trend will probably continue. New fields for the use of die castings will unquestionably open up, for example, atomic energy work is now taking many die castings—this is an entirely new industry. In the older consuming companies, there is a distinct trend to assign men to the specific task of value analysis. As this work continues, these analysts are bound to come up with entirely new applications for die castings."

". . . New uses for zinc and aluminum die castings will help the industry to grow."

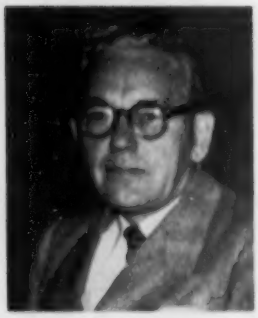
HENRY SCHROEDER, President
Milwaukee Die Casting Company

". . . 1957 is difficult to predict, but we hope it will be as good as 1956 which, in our own case, promises to be a record year, although the industry in general might be finding business somewhat spotty. Improvements in technique, as for example, vacuum die casting for some applications, the increased production of aluminum and the development of new uses for both aluminum and zinc die castings should help to continue the growth of the die casting industry.

". . . I can't, at this time, name any entire new industries which are just becoming customers of the die caster, but the expansion of aluminum die castings may very well bring such entirely new industries and new products as our customers.

". . . One thing that the buyer of die castings could do to insure better castings and better deliveries is to be certain that the low bid is the best one. By that, I mean that a company may submit the lowest bid but not be able to deliver satisfactory castings at the bid price or within the time limit set.

". . . Then, too, bids are not always equitable because drawings are received that are inadequately or incorrectly detailed, or information about the intended use of the die casting is lacking. The die caster who then makes a guess has a 50-50 chance of being wrong. Correction of this trouble would help everyone concerned. Undoubtedly, the wide spread use of "Product Standards" as published by the American Die Casting Institute will eventually do much to correct this situation, and put all bidding on a more uniform basis."



"... High activity in the tool room promises business improvements."

AUSTIN LILLEGREN, Vice President
Madison-Kipp Corporation

"... the prospects for 1957 look encouraging at this time. This is based on our tool room activity, which has been very high for some time. At this time, we have more tools on hand than ever before. A large number of these tools have never really gone into high production. When and if they do start producing on dies we now have ready, there should be a distinct improvement in business. This condition seems to be prevalent throughout the industry."
"... one factor that can make for a future major advance in the entire industry is the development of new die steels that will permit the casting of metals with higher melting points; specifically the copper base alloys. It is not inconceivable that Die Casting Research Foundation research in die materials will lead to a new process in which ferrous base materials can be die cast. Interim improvements in die steels and lubricants will prove important for the die casting of present alloys."

"... The type of castings will be the same, but there will be more of them."

GUSTAV NYSELIUS, President
Mt. Vernon Die Casting Company

"... we believe that our business in 1957 will be somewhat better than in the past. In fact, we are sure enough of this to be adding some 25,000 sq. ft. of floor space to our present plant. The type of castings we will make will probably be about the same as in the past; there will just be more of them."
"... in all probability, the increased availability of aluminum will lead to increased supplies of scrap. This, in turn, will mean more secondary aluminum available and probably at a somewhat lower price. This should tend to increase the use of aluminum die castings."
"... from our experience, castings are becoming both larger and more intricate. We compete more and more with machining operations with the result that the castings are eliminating more and more machining. This is especially true when our customers will consult with our engineers during the design stages so that their parts can be specifically designed to be die cast."
"... I feel that a die casting sales engineer, in the field, can do a very valuable service by holding the designer to a more realistic approach, by preventing over-design which would preclude die casting and by holding dimensions and properties within the compass of die casting. This will tend to bring new work into die cast that previously hadn't been even considered by the customer."

"... Growth of die casters' business depends upon industries they serve."

CHARLES W. OHSE, President
New England Die Casting Company

"... as far as general business for the die casting industry is concerned, it is difficult to even guess at production for 1957. Some of the die casters are pretty well tied to industries that may show no growth and even a decrease. Others are pretty well tied to industries that have a very great potential for expansion; for these die casters, 1957 should show a substantial increase over both 1955 and 1956."
"... any technical advances in the die casting industry will probably come along the lines of vacuum casting. At present, this seems to be the biggest single thing on the horizon."
"... the greatest bugaboo to the die casting industry is the engineering department of the prospective buyer. The designer should get in contact with the supplier and design for die casting. Too often the die caster is asked to quote on a part that has been designed to be made as a stamping or by some other method. Well, it doesn't lend itself properly or advantageously to die casting. By minor redesign, it could be made better and cheaper as a die casting if the designer would just consult with the supplier."

DONALD STROH, President
Stroh Die Casting Company, Inc.

"... Expanded facilities reflect our optimism over 1957."

"... we are optimistic about business in 1957. During 1956 our business was substantially above 1955 and we expect that next year will show about the same gain over 1956. This optimism is reflected, of course, in the fact that we have just completed a new and larger plant and are presently planning an addition. For the next year or year and a half, we will stick strictly to zinc, but the addition we are planning will be for aluminum castings."
"... there is one thing that the purchaser of die castings can do that will help everyone. If they will give the caster all of the design and operating data, we can often avoid costly mistakes. For example, one of our customers had zinc die castings made for use in air conditioning equipment. They proved quite satisfactory for normal installations, but the zinc part indicated lack of stability in a unit recently installed under unusual conditions. A field test indicated aluminum would have functioned under all conditions."

Continued on page 127

Metals:

in 1957, die castings may use 420,000 tons of zinc, 400 million lbs. of aluminum

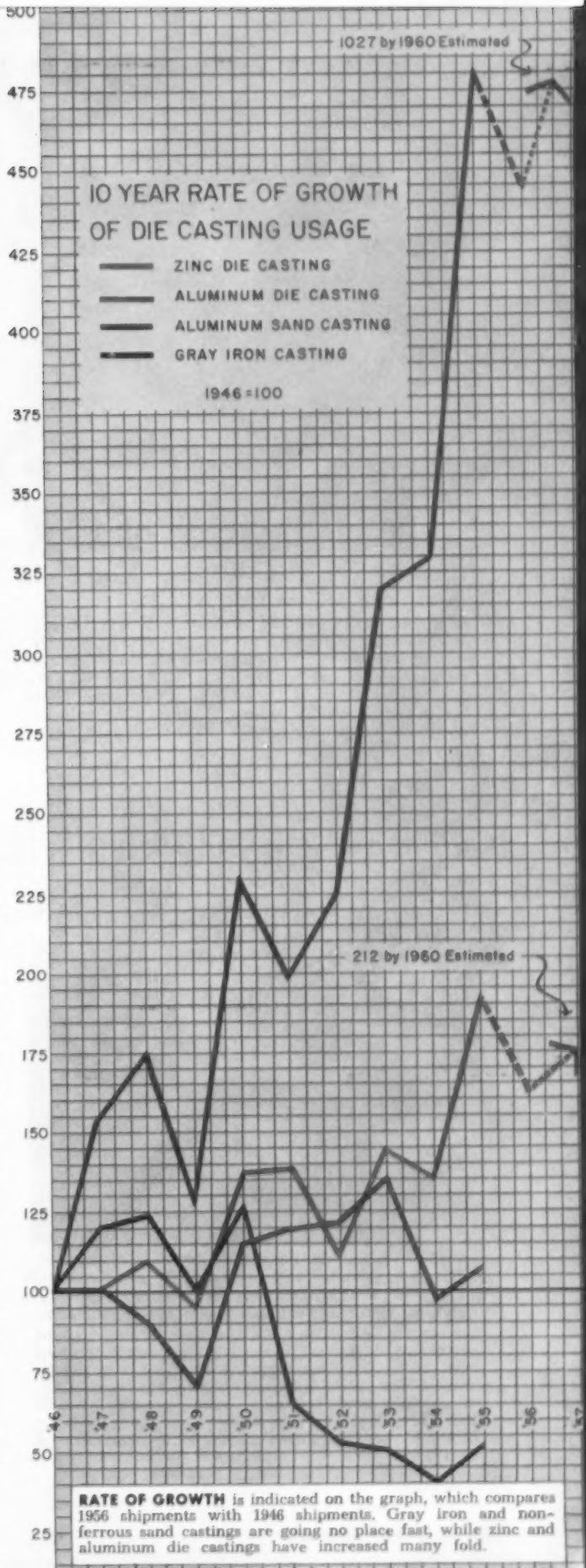
THE pressure has been off the metal sellers most of the year because of a slackening in shipment of die castings, but informed industry sources expect new life in the car market during the fourth quarter to tighten the metal situation considerably.

The producers and smelters of zinc, aluminum and magnesium have had little trouble keeping ahead of demand during 1956, in contrast with the 1955 situation marked by shortages and rising costs. But 1957 will see major model changes in cars and the two-year cycle of new-car buying is expected to push the number of car sales well above current levels.

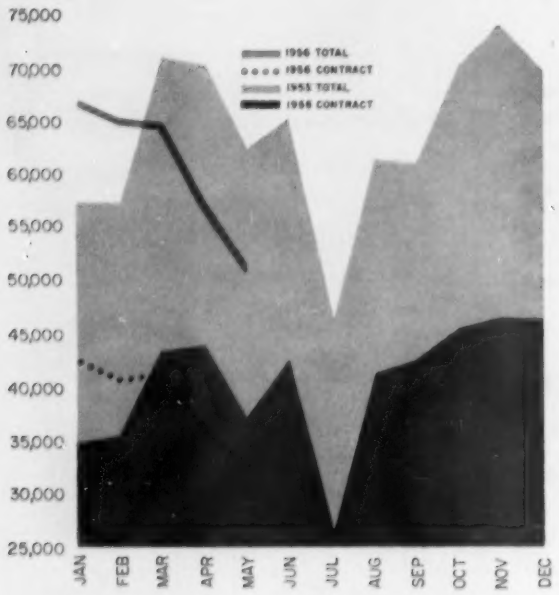
By now, the die castings for new car models are in the tooling or early production stages, and so a clearer picture of the relative amounts of castings per car can be seen.

Once almost totally dependent upon the sale of cars, the die casting industry has shown remarkable strength and has continued shipping healthy volume of castings, despite the sagging car market. This indicates partly the extension of die castings in large volume into other fields of manufacture, such as household appliances which achieved record sales this year. It also shows an increase in the total weight of die castings per car, partially compensating for the loss in number of cars sold.

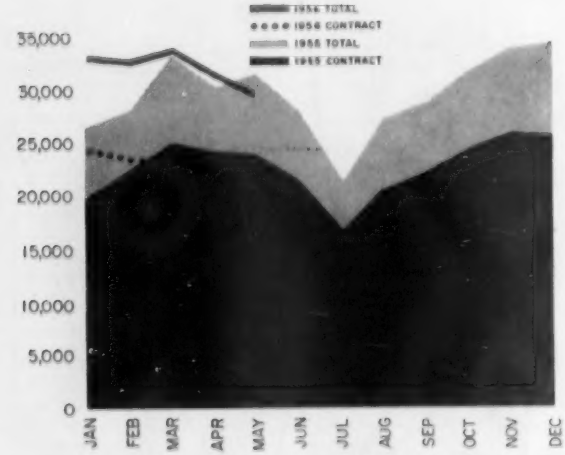
Most predictions by industry spokesmen are cautious, hedged by qualifying reference to possible automotive sales. A booming fourth quarter to help



RATE OF GROWTH is indicated on the graph, which compares 1956 shipments with 1946 shipments. Gray iron and nonferrous sand castings are going no place fast, while zinc and aluminum die castings have increased many fold.



NEW CAR SALES DECLINE brought about a dip in production of zinc die castings early in the year. By May, die castings were moving at a rate somewhat behind the 1955 pace, but still at very healthy levels. All figures above are charted from the U. S. Department of Commerce "Facts For Industry" monthly reports. At press time, only the figures for the first five months of 1956 were available.



ONLY SLIGHTLY BEHIND last year's output, aluminum die castings have held strong this year because a larger percentage of new cars have automatic transmissions than ever before. First five month totals for 1956 were slightly ahead of last year's comparable period, but monthly figures show a downward trend. Industry sources estimate 1956 will be 5 percent behind 1955 when yearly totals are compared. All figures are from the U. S. Department of Commerce.

offset the mid-1956 slack is generally expected and most see this spurt extending into the early months of 1957. As one zinc producer comments, "If cars don't sell, I'm sure the manufacturers are going to start cutting back a lot faster this time than they did last time."

Despite this general feeling of caution, most producers of aluminum and zinc die casting alloys expect their sales to equal or slightly surpass the 1955 record high figures.

Spelling out some of the reasons for this optimism, a spokesman for the job shop die casters points to the fact that while 27 percent fewer automobiles are being produced this year than in 1955, shipment of zinc die castings is down only an estimated 13 percent, while aluminum die casting production is expected to drop only 5½ percent from 1955.

Solid gains in non-automotive applications are the main reasons, according to David Laine, secretary of the American Die Casting Institute, Inc., national organization of job shop die casters, whose estimate early in August shows 1956 production of zinc die castings to be 355,000 tons and aluminum die castings 332 million pounds. These compare with 410,000 tons of zinc and 352 million pounds of aluminum in 1955.

While automotive shipments of zinc die castings by the job shops were down 32 percent this year, a solid 15 percent gain in non-automotive shipments has helped offset this, Laine indicates. Captive production in automotive zinc die castings is estimated to have dropped less than 20 percent.

The Picture For '57 . . . Ahead Of '55

Offsetting gains in non-automotive applications have also been the principal factor in holding current production levels of aluminum die castings up, despite a general drop in automotive shipments of about 20 percent.

Concerning 1957, Laine offers the following evaluation, "The 1957 metal needs will be considerably greater than 1956 use. Automotive applications are more numerous and car output will undoubtedly surpass 1956 even if 1955 totals are not reached. Zinc die casting weight *per car* should average some 8 percent above current models. In aluminum, additional production of automatic transmission equipped cars, as well as new applications will multiply the effect of the higher volume of cars produced. Non-automotive use should continue to gain.

"With major labor contracts on an extended basis with built-in inflationary pressures, the national economy should move from rolling recession to rolling progression. High employment at higher wage levels indicates continuing increases in most products using die cast components. With new uses rapidly developing, the snowball effect appears magnified.

"Assuming 6.5 million automobiles and an increased use per car, 1957 zinc automotive die casting needs will be some 40,000 tons above 1956. With other than automotive use increasing (at the 1955-56 rate) another 24,000 tons can be foreseen. If it materializes, it means a total requirement of 64,000 tons above 1956, or 420,000 tons. This is 10,000 tons above the 1955 high.

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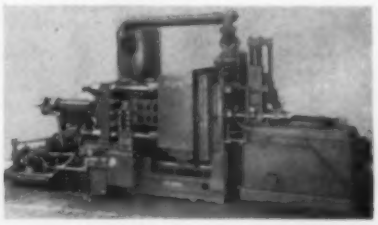
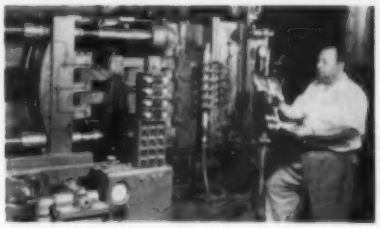
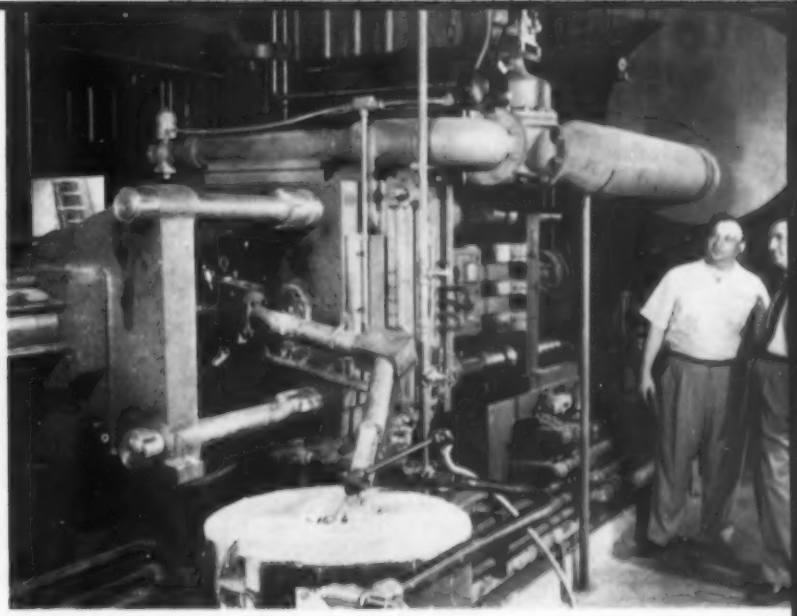






STANDARD VACUUM MACHINE for die casting zinc has been placed on the market by Reed-Prentice. Their #2 machine with vacuum arrangement is shown, top left. First gate of aluminum die castings produced under vacuum in a new convertible unit is being inspected, below.

CONVERTIBLE UNIT for vacuum die casting zinc, aluminum or magnesium is shown above ready for its first run in aluminum alloy. David Morgenstern, general manager of Nelmor Mfg. Corp. (left), demonstrates the new unit to PMM editor David Veit. Stainless steel or ceramic tube connects melting pot with shot sleeve. Previously run with zinc, this Reed-Prentice machine cycled faster than a comparable hot chamber non-vacuum unit.

Technical Developments open up entire new fields of application

ON THE HORIZON . . .

. . . Larger die casting machines capable of turning out complete housings, engine blocks, and perhaps even bathtubs.

. . . Vacuum die casting on a production basis to solve some of those tough-to-cast jobs and perhaps also offer a way to die cast an anodizable aluminum alloy.

. . . New alloys that can be anodized, and new finishes that extend the field of usefulness of die castings.

IF the future of the die casting industry were linked wholly with the fortunes of the automotive industry, there might be some reason to believe that the rapid climb in die casting sales over the past five years might be reaching a plateau. Important changes in the shipment of die castings could come only with fluctuations in the sale of cars.

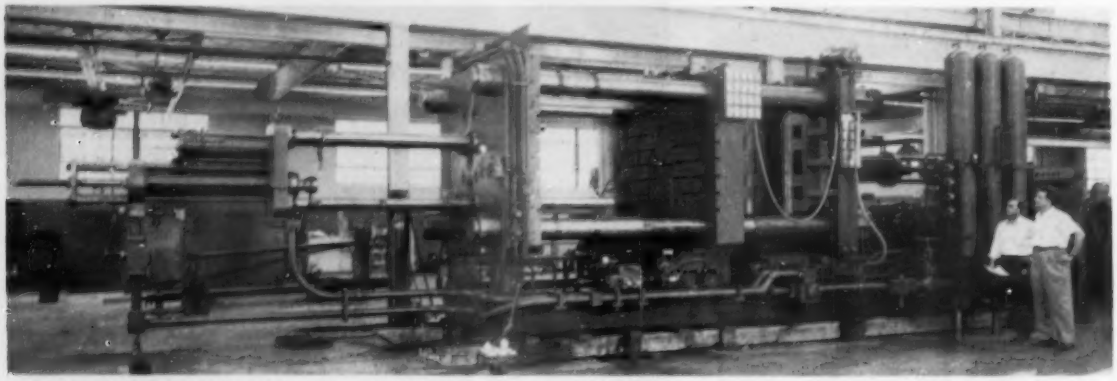
This is not a true picture, although it might have been at one time. The next five years are likely to see a continuation in upward pattern of die casting shipments . . . based only partly upon the continued high production of automobiles.

New technological developments recently introduced or in final stages of preparation promise to open whole new ranges of applications that have previously been uneconomical or unsatisfactory from the viewpoint of performance.

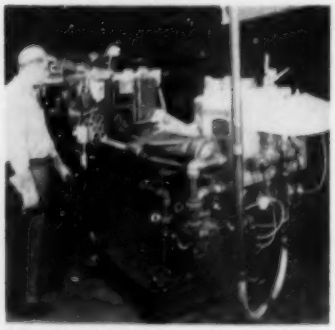
Furthermore, the automotive industry itself will find many new places to use die castings, increasing the poundage of castings per car. This would maintain die casting at or above present levels, even with a possible drop in total car production.

New finishing techniques, too, will play an important part in the over-all picture, and it is quite possible that at least one development in this direction could result in new uses for aluminum die castings.

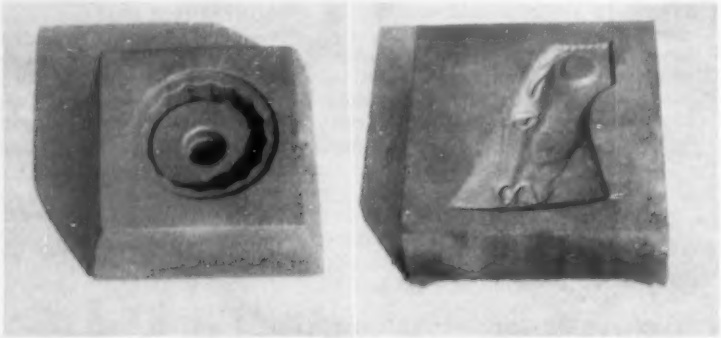
What are some of these important new developments? They include die casting machines in larger capacities, vacuum die casting on a production basis,



LARGEST DIE CASTING MACHINE manufactured commercially is this 1,200-ton Cast Master, shown here being inspected by Cast Master Sales Manager John Palmer and Chief Engineer Myron Malecki as it was being readied for shipment last month. Vital statistics: Tie bar centers 73" x 60"; Tie bar diameter 10"; Die plate 15" thick x 92" wide x 79" ver.; Die thickness 22" min., 54" max.; Die stroke 22" min., 34" max.; Machine size 12' x 40' x 13' high; Gross weight 185,000 lbs.; Max. shot (aluminum) 65 lbs.



NO LADLING is needed with the new automatic pouring units for die casting aluminum, such as this Ajaxomatic unit. Electromagnetic pump on this furnace, manufactured by Ajax Engineering Corp., moves molten metal from beneath surface of the melt and delivers it to the shot sleeve.



CAST DIES first described by PMM (March, pg. 84) drew much interest, some skepticism. So far, four tool and die shops have been licensed to produce dies and some East Coast die casters are negotiating. Shown above are two die cavities as cast, produced for die casters by Shaw Development Corp. The steel used has a composition of .40 C, 5.0 Cr, 1.10 V. Note the as cast surface and sharp detail obtained from the British-developed Shaw process. Process has found wide use for plastic molds and forging dies, as well as die casting die cavities.

TECHNICAL DEVELOPMENTS—continued

development of equipment that eliminates hand ladling of aluminum and magnesium alloys, color anodizing of aluminum, automatic devices for removing large die castings from the die, cast die cavities, and die materials capable of resisting higher temperature alloys.

Here are some of the details. **Larger machines:** As the trend continues toward larger and larger die castings the builders of die casting machinery have introduced equipment capable of meeting these requirements. Several major manufacturers of die casting machines now list units in the 750 to 1,000 ton range as standard models, while one builder has just shipped a machine rated at 1,200 tons locking pressure.

Although a jobbing die caster, the Doehler-Jarvis Div. of National Lead Co. has put into operation a 2,000 ton machine of its own design to die cast complete auto engine blocks, this new machine is reported to be the largest commercially-built machine. This, the first of four 1,200 ton machines being built by Cast Master, Inc. for a major auto manufacturer, will produce housings for a new automatic transmission.

Dies for the new machine will weigh 20 tons, more than the total weight of many average sized die casting machines now in use. Since this machine is capable of cycling at about the same rate of speed as smaller units, it will require the melting of large quantities of metal in order to maintain maximum production rates. Aside from extra melting facilities, other special needs will be some type of automatic ladling into the shot sleeve, and some method of removing castings from the die.

Now that the machine builders and die casters are solving the problems of making and operating equipment to produce large castings, many potential new applications appear, including not only the automotive engine blocks and super-large torque converter housings, but also major housings for large appliances that are now drawn from sheet, rear deck

Continued on page 126

Machine Sales: up 18.8% over 1955 despite casting lag

LONG RANGE planning is evident in the purchase of die casting machines during 1956. Shipment of this equipment continued well ahead of 1955's record pace, despite a lag in casting shipments. This confidence in the future of die casting is being expressed by heavy investments in machines.

While second half estimates show machine shipments down from the first half, total shipments for the year will be 18.8 percent ahead of 1955. Most of this strength appears to be in the sale of cold chamber machines in the higher tonnage range.

New feature of PMM's tabulation of die casting machine sales, based on figures submitted by major machine builders in the United States, is the separation of first and second half totals for the current year. Previously, January-June shipments have been combined with second half estimates to give an *estimated annual total.* On this basis, PMM's survey last year showed an estimated annual shipment of 472 machines in 1955. Actual totals, however, came to only 429 machines due to an unexpected second half drop in hot chamber machine sales. (The actual sale of cold chamber machines was 173, compared to PMM's estimated 174 units.)

Now, in PMM's 1956 tabulation the actual first half shipments are shown, along with estimates of the second half shipments obtained from the machine builders themselves. Second half figures should be firm by mid-August, when they are tabulated, since average delivery schedules require several months lead time. By mid-August, the bulk of this year's machines had been ordered.

Has there been a cut-back in hot

SALE OF DIE CASTING MACHINES IN THE UNITED STATES

	Tons Locking Pressure	1952	1953	1954	1955	1st Half 1956	2nd Half 1956*
HOT CHAMBER	-100	52	64	73	83	52	36
	101-250	16	16	15	39	26	20
	251-400	5	27	8	32	13	16
	401-500	19	22	41	49	27	33
	501-750	5	20	20	43	10	10
	751-1000	4	4	—	10	12	11
	Total	101	153	157	256	140	126
COLD CHAMBER	-100	4	1	4	8	2	3
	101-250	12	16	19	13	7	9
	251-400	38	43	28	39	19	25
	401-500	17	27	37	29	25	18
	501-750	21	30	57	62	55	49
	751-1000	5	16	—	22	16	16
	Total	97	142	145	173	124	120
TOTAL HOT & COLD	-100	56	65	77	91	54	39
	101-250	28	32	34	52	33	29
	251-400	43	70	36	71	32	41
	401-500	36	49	78	78	52	51
	501-750	26	59	77	105	65	59
	751-1000	9	20	—	32	28	27
	Total	198	295	302	429	264	246

*Estimated

HOT OR COLD CHAMBER?

	1952	1953	1954	1955	1956*
Hot Chamber (percent)	52.8	53.1	52.0	59.6	52.1
Cold Chamber (percent)	47.2	46.9	48.0	40.4	47.9

BACK TO NORMAL, hot chamber machine sales are in the 52-53% range again after a busy first half last year during which hot chamber sales reached 63%.

CONTRACT OR CAPTIVE SHOP?

	HOT		COLD	
	1955	1956	1955	1956
Contract Shop (percent)	34.2	34.1	47.8	38.4
Captive Shop (percent)	65.8	65.9	52.2	61.6

WELL-ESTABLISHED, the job shops now buy machines one or two at a time for expansion or replacement; newer captive plants being set up call for large numbers of machines.

chamber machines? The reported drop in shipments of hot chamber machines during the second half of last year was not a symptom of any failure in the demand for zinc die castings. It was actually only a return to the normal relationships between hot and cold chamber machine sales after an exceptional buying spree in the early months of 1955.

For the past five years, hot chamber machines had captured between 52 and 53 percent of the total sales volume; the first half of 1955 found hot chamber machines up to 63 percent of the total. The second half of last year and first half of this are back to normal, with hot chamber machines now representing 52.1 percent of all machine sales.

The year 1955 showed the largest numerical gain in machine sales of any on record: 127 more machines were shipped than in 1954, compared to 1953's previous record gain of 97 machines over 1952. The current year will not equal this record.

What size machines showed the greatest gains? First place goes to hot chamber machines in the biggest size category, with machines having 751-1000 ton locking pressure selling at a rate 130 percent ahead of last year. Still, only 23 units will have been shipped in this class.

Generally, the entire group of cold chamber machines between 401 and 1000 tons capacity show the biggest gain. The 401-500 ton machines are up 48.3 percent over last year, the 501-750 ton machines are up 67.7 percent, and the 751-1000 ton machines are up 45.4 percent.

Influence of the captive shop. Machine builders generally agree that buying habits of the captive die casting plant have had a key affect upon overall sales figures, with the captives taking 65.9 percent of hot chamber machines and 61.6 percent of cold chamber units.

This does not necessarily reflect a *greater number* of captive shops buying, but it shows instead the practice of the captives to buy large number of units at one time. Since the jobbing die casting industry is an old and well-established one, purchases by jobbers are likely to consist of one or two machines at a time to meet new needs or to replace older units. On the other hand, the development of the captive die casting plant on any important scale has been relatively recent, and in many instances, whole die casting plants are set up and all machines bought at the same time. The ability of a general manufacturing company to lay out the very heavy capital investment has had an important influence on machine sales.

Another result of captive buying has been an upward swing in the heavier types of equipment. Whereas the average job shop owner must buy the most flexible piece of equipment available to meet a very wide range of castings for his customers, the captive plant may buy a machine to run a single type of casting.

Also to be taken into account is the fact that many jobbing die casters have tended to build their own machines to meet the needs of their own shops. No figures are available on the number of these "home made" die casting machines now operating in job die casting plants.

Continued on page 134

DIE CASTING MACHINES SHIPPED OUTSIDE THE UNITED STATES

	HOT CHAMBER			COLD CHAMBER		
	1954	1955	1956*	1954	1955	1956*
-100	45	65	95	11	12	4
101-250	12	5	1	11	10	5
251-400	5	—	2	10	5	3
401-500	2	—	1	2	—	—
501-750	—	—	1	3	4	1
751-1000	—	—	—	—	1	3
Total	64	70	100	37	32	16

*Estimated

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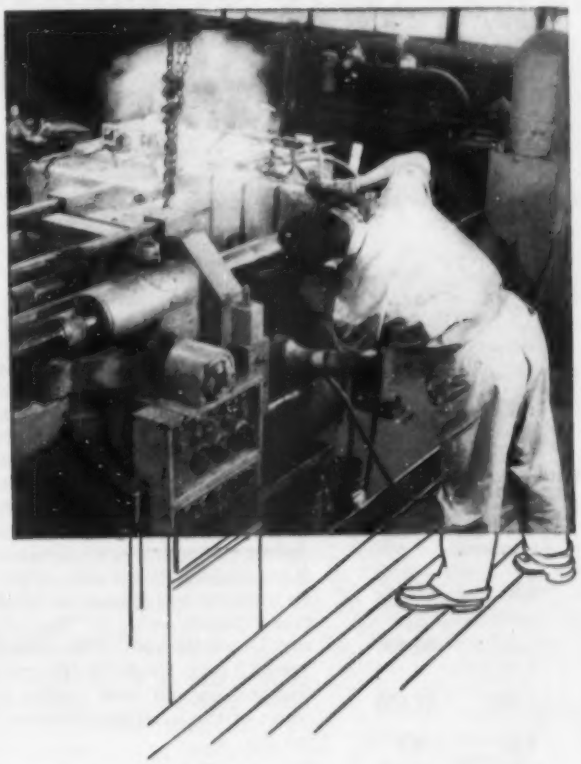
'Aquadag' Cuts Rejects 30%

—reports Bendix



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Slip Casting

TABLE 1. Composition and Properties of a Casting Slip

Composition	
-325 stainless steel powder (302B)	18.8%
-100 stainless steel powder (302B)	18.8%
-200 stainless steel powder (302B)	18.8%
-100 + 160 stainless steel powder (302B)	18.8%
elvanol	0.25%
ammonium alginate	0.35%
water	24.2%
Properties	
Density	6.62 gm/cc
Ultimate tensile strength	70,500 psi
Yield strength (0.2% O.S.)	40,200 psi
Elongation	20%

TABLE 2. Composition of Slip Giving Highest Sintered Density

-325 stainless steel powder (302B)	25%
-200 stainless steel powder (302B)	25%
-170 + 200 stainless steel powder (302B)	25%
elvanol	0.25%
ammonium alginate	0.35%
water	24.4%

TABLE 3. Comparison of Properties

Property	Wrought (a)	Cold Pressed 70 tsi (b) Sintered 1 hr. 1275°C	Cold Pressed 50 tsi (b) Sintered ½ hr., 1210°C	Slip Cast
Density, g/cc	8.03	7.33	6.51	6.41
Yield Strength, psi	30,000	—	—	40,400
Ult. Strength, psi	80,000	93,357	24,400	57,500
Elongation %	40	37	6.6	9.8
Hardness	$90R_B$	$83R_B$	$69R_F$	$60R_F$

(a) Data from reference 2

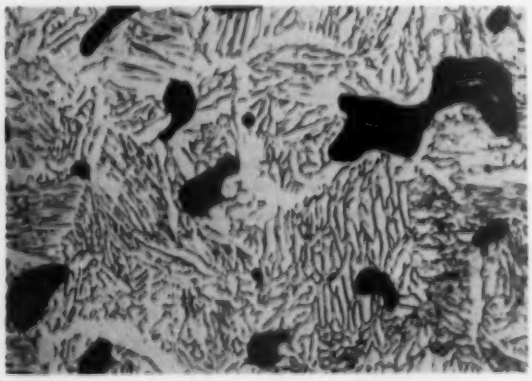
(b) Data from reference 3

Evaluation

Density. Green density of the as-stripped slip as determined by the usual Archimedes' technique was difficult to obtain primarily because of the fragility of the slip. Considerable fractures resulted when attempts were made to lacquer the slip, and hence density determinations were obtained from sections of the slip only. In no instance was it possible to obtain a density value for the entire slip. Densities from sections averaged 3.2 g/cc. Considerable variation was encountered, chiefly because of the inherent moisture in the slip.

Sintering. The as-stripped sample was placed in a boat formed from a refractory brick. This assembly was then placed in the front por-

Longer sintering gives greater density . . .



4a. Sintered 8 hrs. - Density 6.1 g/cc - 250X.

4b. Sintered 16 hrs. - Density 6.95 g/cc - 250X.

Of Stainless Steel Powder - Part 2

BY W. G. LIDMAN AND R. V. RUBINO
Atomic Energy Division
Sylvania Electric Products, Inc.

tion of the hot zone so as to allow the sample to outgas. After several minutes had elapsed, the sample was moved into the hot zone. A temperature of 1320 C, which is approximately 65 C below the melting point, was found to be the optimum sintering temperature. A reducing atmosphere of hydrogen with a dew point of −72 C was used.

Sintering for 16 hours at these conditions produced samples which were relatively clean and which were densified to 6.4 g/cc (80% theoretical).

Results and Discussions

Use of oxides. An investigation was conducted using chromium oxide (Cr_2O_3), nickel oxide (NiO) and iron oxide (Fe_2O_3) as slip components in quantities such that the oxides, after being chemically reduced, yielded a sintered product consisting of 18 percent chromium, 8 percent nickel, and the remainder iron. Initially the oxides were blended with tap water alone. However, this yielded a noncohesive slip which did not provide a section suitable for sintering.

The usual binders ammonium alginate and elvanol were then added to the oxides and water mixture. A partially cohesive slip was obtained which was sintered at 1320 C in hydrogen. Physical measurements of the piece before and after sintering indicated a 90 percent volume reduction.

The combination of electrolytic iron powder plus chromium oxide and nickel oxide was then tried in an attempt to combat this excessive shrinkage. A segregated slip was obtained with this mixture of powders which could not be used to obtain significant results. The segregation was probably caused by the difference in densities of the powders which were used.

Drying. Results from the initial sintering experiments yielded samples containing a considerable number of air holes, which were attributed to the entrapped moisture which generated steam during the heating cycle. An attempt to dry the as-stripped slip at approximately 100 C for one hour prior to sintering resulted in an extremely dry slip, which could not be handled. In some instances, the drying effect was severe enough to transform the slip into a small mound of powder. Shorter drying times produced the same results.

Vacuum drying at 800 C was also investigated. In anticipation that this elevated drying temperature might also serve as a presintering temperature. A powdery product, which could not be handled without fracturing was produced by this treatment. Consequently, the drying technique was omitted, and sintering was conducted immediately after stripping in order to eliminate any unnecessary handling operations.

Comparison of Properties

Samples prepared in this investigation were cast in the shape of tensile samples in order to facilitate evaluation of physical properties. The results obtained in the evaluation of these tensile samples were not reproducible in many cases. For example, samples prepared from slips made under the same conditions showed variations in sintered density from 5.2 to 6.4.

The best strength properties were obtained with samples produced from a slip as indicated in Table 1.

The sample cast with this slip was sintered at 1320 C for eight hours and had the properties shown in Table 1.

A slip was prepared which had a higher percentage of fine particles. The sintered density of this sample was 7.08 g/cc which was the highest density obtained in this investigation. Composition of this slip is shown in Table 2.

Figure 4 a and b shows that the low density of the sintered pieces was a result of porosity in the sample. A comparison of the two photographs indicates that increased sintering time decreases the porosity resulting in increased density. In addition, an increase in grain size was also evident with extended sintering time.

A comparison of the properties of a slip cast sample with cold pressed and sintered stainless steel and wrought iron material is shown in Table 3.

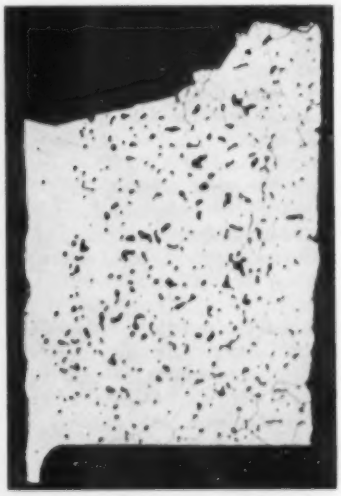
The data for the slip cast sample was selected in order to be representative of average material which was evaluated. As mentioned earlier, samples were produced with higher density as well as strength, but these data were not used in the comparison with other materials, because at this stage of the development it was not considered to be typical of samples tested.

Continued on next page

The higher strength and density values which were reported above, however, do indicate the feasibility of producing material by slip casting which has desirable properties.

A comparison of the data in the above table shows that generally the density of slip cast material is lower than the wrought and the cold pressed and sintered material. The strength of the cold pressed and sintered sample which has a density of 6.51 g/cc is considerably lower than the strength of the slip cast material which has a slightly lower density.

These results may be an indication of the sintering action obtained in each process. As indicated earlier, the density of the slip cast sample before sintering was approximately 3.2 g/cc, and during sintering, there is great shrinkage. The increase in density during sintering is an indication of considerable diffusion between particles to form strong metallurgical bonds. In the case of the cold pressed and sintered pieces however, the density increased from 6.47 to 6.51 g/cc during sintering. This slight increase in density indicates slight diffusion or bonding between particles has occurred and therefore the strength results primarily from the mechanical bonds established during cold pressing. Increased strength is obtained for cold pressed samples when the density is high, as shown by sample having a density of 7.33 g/cc.



5. Photomicrograph of tensile sample showing fracture. —14X, reduced one third.

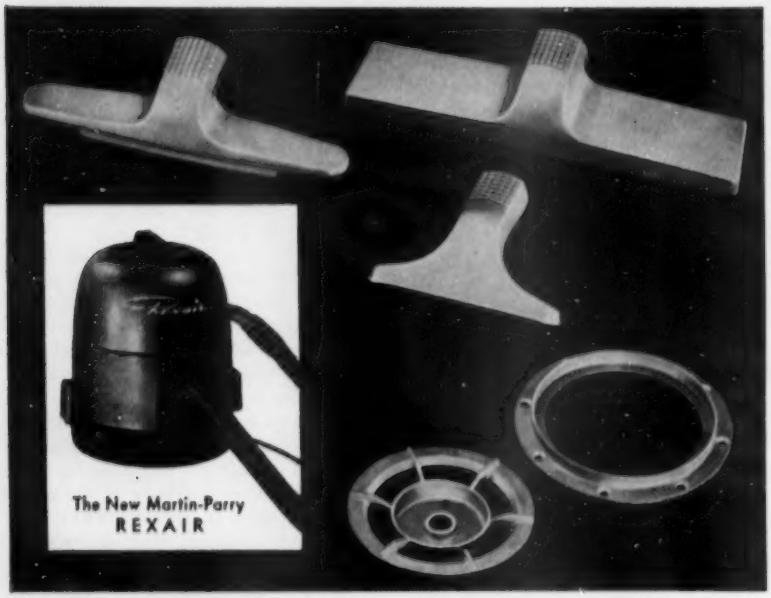
A photograph of the fracture of a slip cast tensile sample is shown in Figure 5. The fracture is typical of that obtained for all samples tested. Little reduction in area or necking down was measured at the fracture, which is an indication of the brittleness of samples. The presence of voids and the low density of the material are probably the cause of the brittle fracture as well as the low percent elongation.

Summary

The investigation described was conducted in order to determine the feasibility of preparing solid material by slip casting of metal powders. A method is described which produced slip cast samples of relatively good physical properties. Some of the variables were not completely evaluated and

Continued on page 98

Martin-Parry Corporation saves money and maintains quality with



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The American Die Casting Institute has just issued the first several of its Metallurgical Series of Product Standards for Die Castings, providing useful data as a guide to engineers and designers. Standards covering the composition, properties, and characteristics of magnesium and copper base die casting alloys are presented here. Complete copies of all Standards are available by writing to American Die Casting Institute, Inc., 366 Madison Ave., New York 17, N. Y.

Magnesium Base Alloy Die Castings

1. ALLOY SELECTION

The magnesium alloy shown below is the standard composition generally used. This standard alloy is available in a high purity composition with 0.10 maximum copper content, (designated AZ 91A) having improved corrosion resistance.

2. COMPOSITION AND PROPERTIES

The chemical compositions of magnesium base alloy die castings and related typical values for physical properties and constants are shown in the table. The typical values indicated are for separately die cast test-bars and do not represent values for specimens cut from die castings.

COMPOSITION-PERCENT (1)		PROPERTIES AND CONSTANTS (2)	
Commercial & ATSM	AZ91B	Commercial & ASTM	AZ91B
Aluminum	8.3 to 9.7	Tensile Strength, psi	34,000
Zinc	0.4 to 1.0	Tensile Yield Strength (0.2% offset) psi	23,000
Manganese, min.	0.13	Elongation, % in 2 in.	3
Silicon, max.	0.5	Shear Strength, psi	20,000
Copper, max.	0.30	Compressive Yield Strength, psi	22,000
Nickel, max.	0.03	Ultimate Compressive Strength, psi	58,000
Others, total, max.	0.3	Fatigue Strength, psi (3)	14,000
Magnesium	Remainder	Specific Gravity	1.80
		Weight per cu. in., lb.	0.066
		Thermal Conductivity, CGS	0.17
		Thermal Expansion, in./in./°F (4)	15.2
		Electrical Conductivity, % of Copper Standard	10

(1) Composition in per cent as shown. Cf. ASTM B94.
(2) Data furnished by Dow Chemical Co.; ADCI; ASTM.
(3) R.R. Moore rotating beam test at 500,000,000 cycles.
(4) To be multiplied by 10^{-6}. Temperature range 68° to 392°F.

3. CHARACTERISTICS OF MAGNESIUM ALLOYS

Magnesium alloy die castings are the lightest in weight and easiest to machine of all die castings. Mechanical properties approximate those of aluminum alloy die castings and strength-weight ratio is higher.

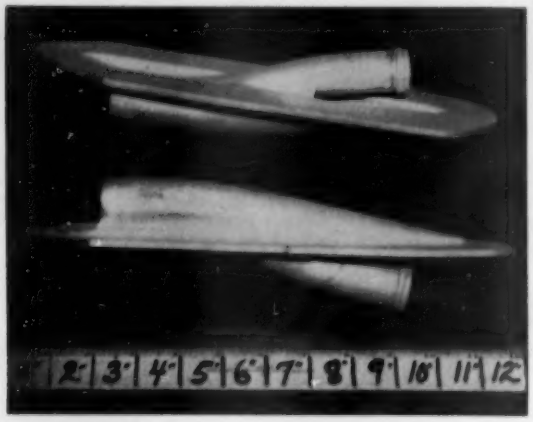
Magnesium alloy die castings are usually treated by the die caster with a chrome pickle or oil dip coating. The treatment protects against the tarnishing or slight surface corrosion which can occur on unprotected die castings during storage in moist atmospheres. Proper selection of treatment depends on subsequent finishing methods, a variety of which are available where required.

Die castings are not usually solution heat treated. The standard alloy is suitable for the majority of applications. Where maximum corrosion resistance is required, the special low copper composition may be specified.

4. MAGNESIUM BASE ALLOY CROSS REFERENCE CHART

COMMERCIAL DESIGNATION			AZ91A	AZ91B
NOMINAL COMPOSITION			Al 9% Zn 0.7%	Al 9% Zn 0.7%
Symbol	Specifying Organization	General Spec. No.	DESIGNATION USED IN SPECIFICATIONS	
ASTM	American Society For Testing Materials	B94	AZ91A	AZ91B
SAE	Society of Automotive Engineers		501	501A
FED	Federal Specifications	QQ-M-38	only	
AMS	Aeronautical Material Specs	4490D	only	

TYPICAL SIZES AND SURFACE FINISHES OBTAINED . . .



NOT RESTRICTED to small, simple shapes, these plaster mold castings have a complex core.

PRODUCTION FINISH can be obtained in the neighborhood of 100 micro-inches, with 50 to 60 on selected surfaces.

What you can expect from

Magnesium Plaster Mold Castings

By E. J. WILLIS, Development Div.
Aluminum Company of America

THE use of plaster molds in a modern magnesium foundry, though relatively new, is finding applications where normal sand castings never hope to compete. Plaster molds are made-up essentially of partially de-hydrated gypsum and water. The molten metal is poured into this plaster cavity. Current work at our magnesium foundry at Buffalo, New York, has produced better tolerances and smoother physical surface conditions, as well as a reduction in cost of the final part by eliminating machining.

The usefulness of this process should be understood both by foundrymen and designers so that castings made by this process will provide the necessary surface and critical dimensions without increasing the cost of the casting more than necessary.

Size and Range

Because of the variety of parts that have been cast, it is now known that the size of castings which can be made in magnesium range from less than one ounce to over 100 pounds. At present, this range is not limited in any way, since difficulties have not been encountered, and larger castings than this 100-pound limit will probably soon be tried successfully.

Castings vary from a maximum dimension as small as one inch to over three feet have been successfully cast. Here again, the limitations are only from background and not from any limitation caused by the use of plaster. Maximum dimensions will increase rapidly as the process becomes better known and its usefulness appreciated.

Surface Roughness

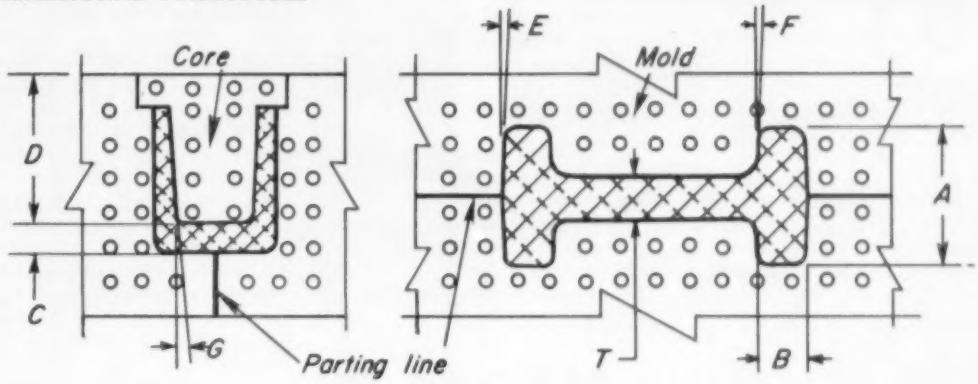
The usefulness of plaster in making molds for magnesium castings is the production of exceptionally smooth surfaces compared with sand-cast parts. The surface finish obtained on magnesium sand castings will vary considerably from piece to piece, but in general, the surface will be between 500 and 800 micro-inches, unless special finishing techniques are employed.

When plaster is used as the mold material, surface finishes in the neighborhood of 100 micro-inches are common. At the present time, finishes which range as low as 50 or 60 micro-inches can be found in some areas on the casting, but from a specification standpoint, one would be hesitant to accept castings which require this finish on all surfaces.

Where agreement can be reached between the casting user and the foundry, special care can be exercised to obtain exceptionally smooth surfaces in specific and limited areas. These special requirements should be indicated

PLASTER MOLD CASTINGS

DIMENSIONAL TOLERANCES



A **ACROSS THE PARTING LINE:** ±0.010 for 1" or less; above 1" add 0.001 to tolerance per inch of length.

B **BETWEEN POINTS** produced by one part of the mold: ±0.005 for 1" or less; above 1" add 0.001 to tolerance per inch of length.

C **BETWEEN POINTS** produced by a core and the mold: ±0.010 for 1" or less; above 1" add 0.001 to tolerance per inch of length.

D **MAXIMUM LENGTH** of core supported at one end: diameter of core X 5. If supported at both ends, the length of a small-diameter core may be as much as ten times the diameter.

E **DRAFT:** 0° draft is permissible in many cases; 2° is desirable.

NOTES:

- **MINIMUM DIAMETER** of separate cores, ¼".
- **MINIMUM THICKNESS (T)** for distance of: (a) 3" or less, 1/16"; (b) 3" to 6", 3/32"; (c) over 6", 1/8".
- **SETUP:** When plaster is used in a particular area of a casting to gain a dimensional advantage, this area of the casting should be used to set up from for machining.
- **MINIMUM RADIUS** of fillet. Sharp corners can be cast when desired.
- **NOMINAL SURFACE FINISH:** 125 microinches RMS or better.

on the drawings and negotiated at the time that quotations are made.

Castable Alloys

Production of magnesium castings by the plaster mold process has indicated that all normal magnesium alloys which may be sand-cast can be cast equally well in plaster molds. In addition to these standard alloys, the usefulness of the process may extend itself to both magnesium rare-earth zirconium and the magnesium-thorium-zirconium alloys if the demand for high-temperature castings to close tolerance and smooth finishes continues. There are many jet-engine and guided-missile applications that may soon require these alloys for proper functioning of the machines. This will be a natural outgrowth of the room-temperature applications already in production.

Dimensional Tolerances

The drawing shows typical sections through castings produced in plaster. This shows the necessary parting lines, draft, and thickness relations.

Dimension "A" is taken across the parting line where there are two mating mold pieces. A tolerance at this point of ± .010 for the first inch or less and an additional .001 for each additional inch of length should be added.

Item "B": Between points produced by any one part of the mold, a tolerance of ± .005 for the first inch or less and an additional .001 should be added to this tolerance for each additional inch of length.

Item "C": Between points produced by a core in the mold, tolerances of ±.010 for one inch or less plus an additional .001 for each additional inch.

Item "D": The maximum length of core supported at one end is normally five times the diameter of the core, where if the core is supported at both ends — the length of a small-diameter core may be as much as ten times the diameter.

Items "E", "F", and "G": At many points in castings using plaster cores and plaster molds, zero draft is permissible. This is especially true in local areas; however, as a general rule, 2° is a desirable amount. As far as general rules are concerned, the minimum diameter of separate cores should be approximately ¼".

The minimum thickness shown as a T-dimension in this slide should be considered as about ⅛" over 6" linear dimension. In local areas, where an area does not exceed about thirty square inches or three to six linear inches, thicknesses as low as 3/32"

Continued on next page

can be tolerated. There have been some castings where very small local areas need to be very thin, but are fed easily by surrounding thicker sections, and 1/16" thickness can be produced.

When plaster is used in conjunction with the sand-cast process to obtain local dimensional advantage these particular areas of the casting produced by the plaster should be used for set-up purposes in machining. Both internal radii and external radii can be reduced considerably over sand-cast magnesium. Sharp corners can be cast with the plaster process when required.

Where to Use

As the use of plaster mold castings in magnesium becomes better known, plaster will be used in conjunction with the sand-cast processes and with permanent-mold castings.

From an economical standpoint, plaster mold castings will be considerably more expensive than green sand and should be used only where the specific advantages of the plaster process are important. These advantages include the ability to produce detailed lettering or markings on castings, local smoothness for air flow or oil flow, and close-dimensional tolerances for reduced machining or hand finishing.

Much thinner sections can be produced when using plaster cores in combination with other mold materials such as sand or permanent-molds. The mechanical properties of composite plaster and sand castings will be better than plaster alone can produce.

Mechanical Properties

Since no paper would be complete without some indication of mechanical properties obtainable by the plaster mold process, some of the differences between plaster castings and magnesium sand castings will be mentioned. Much of the work so far has been on castings with relatively thin sections, sometimes with special dimensional tolerances and special surface conditions. For this reason, the mechanical properties surveyed so far are relatively limited.

Using AMA263-T6 as the alloy for comparison, the results indicate the same yield strength as sand cast AMA263-T6 (19,000 psi) can be obtained, but the tensile strength and elongation are slightly less in plaster. These results are based on a test-bar diameter of ½". In thinner sections, this difference will decrease considerably, while in thicker sections we expect that there will be few cases where both sides of the section will be produced in plaster. The additional chilling effect of the sand will reduce these differences.

Future

There are probably many uses for magnesium plaster castings which only await proper publicity before industry demands these castings where savings are apparent. A gradual increase in size of castings so produced is anticipated, as well as possible use in fields where normal sand castings are not usually considered. As our foundries become more familiar with the plaster process, better tolerances can be obtained and better surface-finish control.

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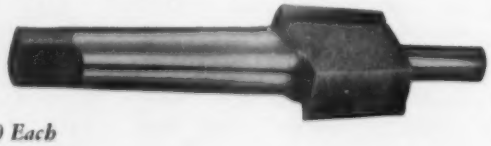

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SIMPLEST ASSEMBLY is made possible by using the ductility of the zinc alloy. The center gear is pressed through a cored hole in the gear housing. Three gears are slipped over cast bosses to mesh with the center gear, and then . . .

COVER IS SLIPPED OVER so that integral gear meshes with planetary system. Spinning over the center boss holds the assembly together. The outer housing encloses the entire unit, and is permanently fastened by peening over two die cast lips.

Accurate center relationships, and good tooth contours in zinc die castings make this a . . .

Close Meshing Gear Train

THE close relationship among five gears is established and held by means of die casting . . . without any machining of the castings . . . in a compact new jalousie window operator that is reaching the market this month.

With the sale of jalousie windows gaining very wide acceptance among home owners and builders, a Cleveland firm, the Accurate Die Casting Co., has developed and acquired patent rights on an entirely new type of unit to operate the jalousies. Basic design of the new window operator consists of a planetary gear system driven by a nylon pull cord; conventional operators are worked by a crank and worm gear arrangement.

The use of spur gears in place of a worm gear is said to give the new unit longer life and smoother operation than the older type jalousie regulator. The ability to die cast a system of five separate gears, and the posts for mounting three of them, with such accuracy that they mesh perfectly without machining, is the key to the successful operation and low cost of this unit, called "Reel" operator.

The engineers who worked out the details of the new jalousie operator also have taken into account the special properties of the zinc alloy die castings to simplify their assembly line procedures. In fact, they have utilized the superior ductility of the zinc alloy and have dispensed with all fasteners. Five individual fastening operations require only the spinning or peening of the die cast material to provide permanent assembly.

How this works is illustrated by the assembly of the gear system, which can be seen assembled and disassembled above. A shouldered gear cast as part of a link, is inserted through an opening in the front gear housing. Then, three spur gears are slipped into place over cast mounting bosses so that they mesh properly with the central gear.

The cover die casting also has a gear formed on its inside surface, so that when the cover is slipped into position, this gear meshes with the three spur gears. A central hollow boss on the cover die casting extends through the center hole in the other main gear and is spun over, securely locking the entire assembly in place.

The gear system is packed with grease for permanent lubrication, and the close-fitting pair of die castings which are securely fastened together assure long service. This eliminates one problem that has been common with the worm-type operators . . . the penetration of grit or sand into the gearing with consequent shortening of life of the operator.

Despite the precision with which the five gears mesh (they fit into the unit in only one way) the

GEAR TRAIN—continued

average girl working on assembly can easily assemble the unit without extensive training. This is largely due to the self-fastening features described above.

Naturally, appearance is another prime consideration, as is resistance to corrosion. The most widespread use of jalousies is to be found in the South, especially in those states along the ocean and Gulf, and consequently it is important that the operators have good resistance to the effects of salt atmosphere. The zinc die castings are being given an electroplated finish which will enhance both their appearance and their durability. Satin finish has been selected, rather than bright lustre, as being better in keeping with domestic interiors.

Although Accurate Die Casting is a jobbing die caster, these jalousie operators will be manufactured and distributed as a proprietary product. The company's many years of experience producing die cast components for window hardware, such as jalousie regulators, interested them in the basic design problem of producing a superior unit.

H-P-M IS MERGED WITH KOEHRING CO.

Arrangements for merging Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, into the Koehring Company of Milwaukee were completed recently when a stockholders' meeting of the Koehring Company ratified the agreement.

Julien R. Steelman, president of Koehring, said that in excess of 12% of the outstanding shares required to approve and adopt the merger plan was voted in favor of the merger. At a similar meeting on June 14, stockholders of H-P-M approved the plan overwhelmingly.

G. B. Robinson, chairman of H-P-M, has been named to the Koehring board of directors. No changes in the management or policies of H-P-M are contemplated, Steelman said. The company will be operated as a division of Koehring.

The merger, according to Steelman, will permit Koehring Company, a major producer of construction equipment, to further diversify markets for its products.

H-P-M is an important manufacturer of metal working presses, plastic injection molding and die casting machines, hydraulic components and metal baling and steeping presses.

BUY FLUX COMPANY

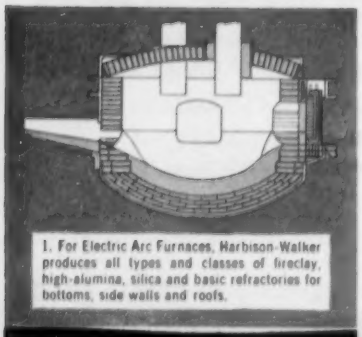
Roy E. Ferree, vice president of Treesdale Laboratories and Textile Processing, Inc., Mars, Pa., announces the purchase of the Pittsburgh Metals Purifying Company, Pittsburgh, Pa., from the estate of the late Peter Soffel, who founded the company in 1928.

Pittsburgh Metals produces exothermic compounds and fluxes for the metals industry at its plant at 1352 Marvista St., North Side, Pittsburgh.

As a subsidiary of Treesdale Laboratories, Pittsburgh Metals Purifying Company will continue operations under the direction of C. A. Marlowe, general manager.

HARBISON-WALKER

REFRACTORIES



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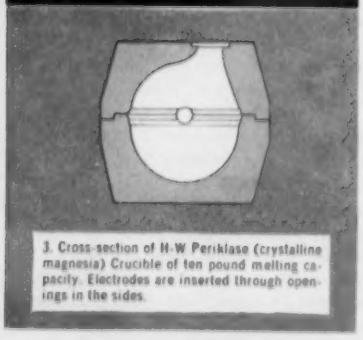

3. Cross-section of H-W Periklase (crystalline magnesia) Crucible of ten pound melting capacity. Electrodes are inserted through openings in the sides.

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Powdered Iron Pawl Is Designed...

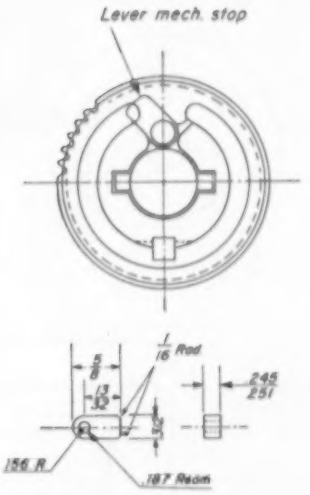
To Meet High Impact Load

FOR fringe area television reception it is common practice to provide a rotatable antenna. Such a device must be rotatable a full 360 degrees, but must also be provided with a positive stop. This stop must be designed to function for both clock-wise and counter-clockwise rotation.

The particular device that has been developed by the Radiart Corp. for this service is a powdered iron pawl shown in Figure 1. This pawl operates against an aluminum die cast stop and both the pawl and the stop are subject to high impact loading.

The drive gear, on which the pawl is fastened, operates at one revolution in 45 seconds and the full torque developed by the motor and reduction gearing is six foot pounds. In addition to the full motor torque the antenna will oscillate due to wind action. When in the fully rotated position, generally due North, the powdered iron member is tight against the die cast stop. As wind action sets up oscillation of the antenna this is transmitted to the drive mechanism and creates a severe pounding action of the pawl against the stop. Obviously, during periods of high wind velocity forces of considerable magnitude can be set-up all of which must be absorbed by the rotational stop mechanism.

This combination of full drive torque and the pounding action resulting from oscillation of the antenna is "taken" by the powdered iron part without any evidence of damage, regardless of wind velocities.



MAT'L SPECS: L1007 Steel
FINISH SPECS: Oil impregnated with graphite oil - 15 to 20 Min. Tumble for surface smoothness

POWDERED IRON PAWL, shown above, must resist severe pounding action caused by wind action. Top drawing shows how the pawl is assembled into the drive gear.

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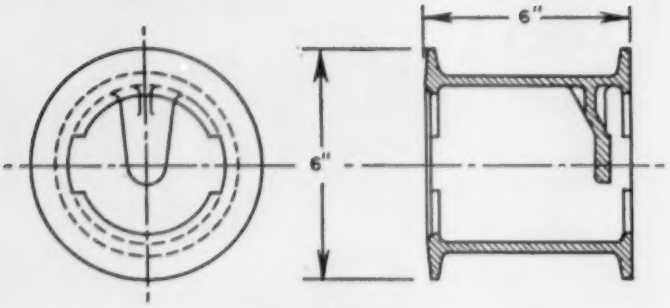
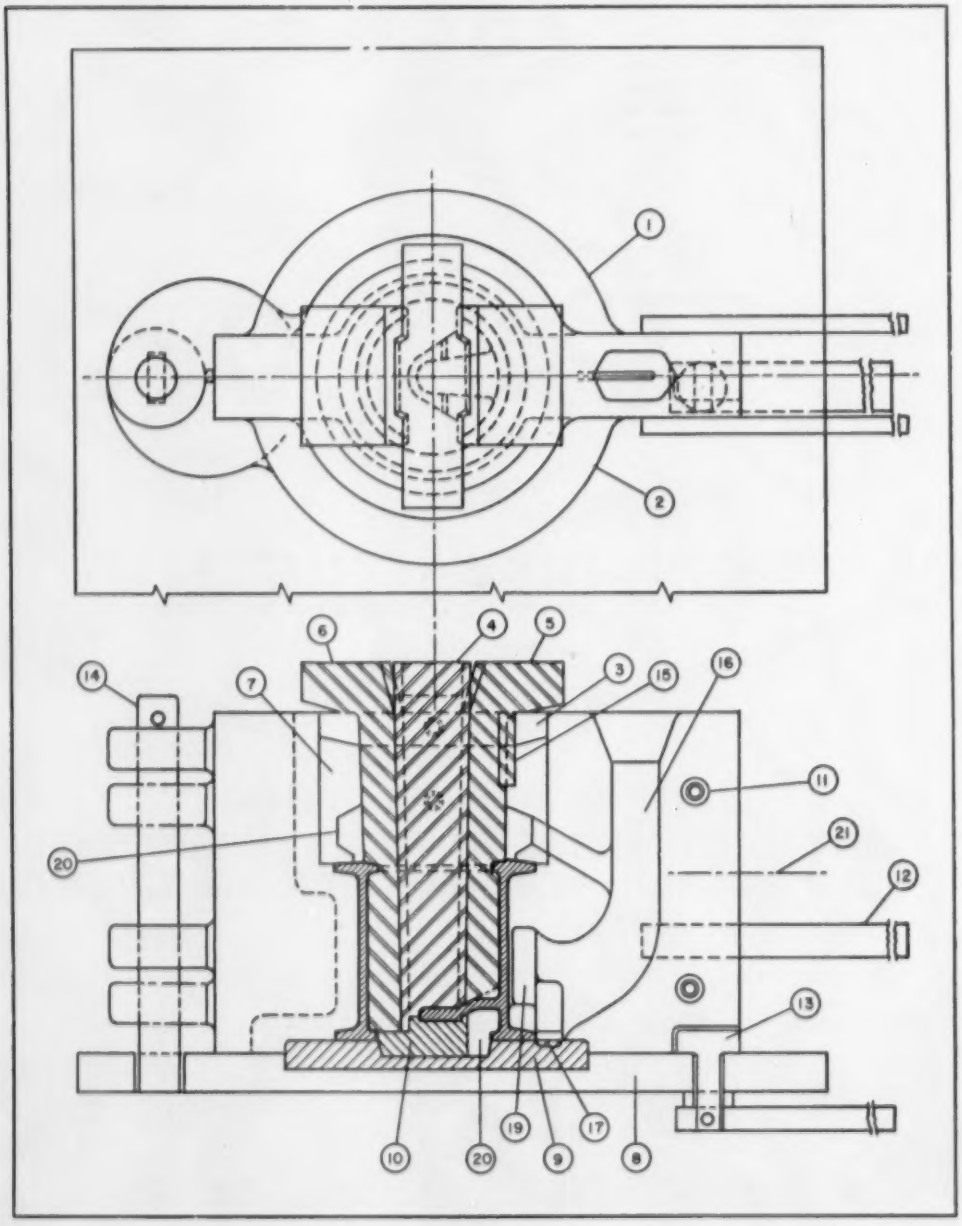
THE CASTING . . .



This permanent mold

Mold

AND THE MOLD



casting and suggested mold design show how...

Construction Allows Design Freedom

By SAMUEL LASHUTKA

IN permanent mold casting, it has been said, "the mold is built around the casting." Without the limiting cope and drag of sand casting, or the rigid machine of die casting, the tool designer planning a permanent mold can detail multiple mold sections, pull successive cores by hand, or even introduce sand cores where a solid core could not be withdrawn.

The flexibility of permanent mold casting, for the product designer, arises from this freedom in adapting mold design to product shape. This is not to imply that permanent mold casting does not have shape limitations, nor that the cost of the more complicated mold structures is always economically justified.

Where die casting gains its high rate of production, and elimination of manual operations by virtue of the rigid die casting machine, the permanent mold process trades these for other advantages, such as the slower rate of chilling of the casting, the lower capital investment in machinery, and the greater freedom of mold design. Each process has its range of usefulness, based not only upon shape and size of castings, but principally upon the quantities of pieces.

Shown here is a typical permanent mold casting, and one practical solution to the problem of designing a mold for it. This is not the only possible design . . . the choice of mold construction being based upon the specific requirements of the casting.

Naturally, the more complicated the mold becomes, the higher the cost, and although it is possible to produce castings, it sometimes becomes excessively costly. It is a matter for the designer and methods engineer to determine the break-even point at which the cost of tooling is still more economical than an alternative manufacturing method. It is always a wise policy to obtain the advice of an experienced and reputable casting producer during early stages of design in order to gain every possible advantage from the process.

The main features of the mold design shown here are the three-piece solid core and the sand core. These form portions of the casting that would be difficult to cast otherwise. It is usually more

What you should know about mold operation

THE DESIGNER of permanent mold castings can profit by having a basic understanding of the typical construction of the molds that will produce his castings. Enumerated below are mold components, and the sequence of operations to produce the casting illustrated.

MOLD COMPONENTS

1. Mold sector #1
2. Mold sector #2
3. Core sector ring (mounted to mold sector #1)
4. Center core sector
5. Side core sector #1
6. Side core sector #2
7. Mold insert (insert fastened to each mold sector)
8. Base
9. Base insert
10. Base insert plug
11. Locating dowel & pins
12. Mold handle
13. Mold operating device
14. Hinge pin
15. Locating key
16. Gate runner
17. Gate
18. Gate riser
19. Top riser
20. Sand core
21. Mold lock

SEQUENCE OF CASTING OPERATIONS

Step 1. Locate the sand core in the mold.
Step 2. Close the mold sector (1).
Step 3. Put the core sector (5) and core sector (6) into the mold sector (1).
Step 4. Locate the center core sector (4) between core sectors (5) and (6).
Step 5. Blow out mold sector (1) in close position.
Step 6. Close mold sector (2) and lock in place, together with mold sector (1).
Step 7. Pour molten metal into gate runner.
Step 8. Allow metal to solidify.
Step 9. Open mold lock.
Step 10. Remove core sector (4).
Step 11. Remove core sectors (5) and (6).
Step 12. Open mold sectors (1) and (2).
Step 13. Remove casting.
Step 14. Blow out excess remaining sand from base insert plug.

desirable to attempt to design a mold using only solid cores, before resorting to the sand cores.

Identified here, for the benefit of the product designer, are the separate components used in this mold design and the steps in the separate components used in this mold design and the steps in the production of the casting. Visualizing these elements, it may then be possible for him to discuss the design of his castings with his supplier more effectively.

Familiarity of the designer with the working details of the process for which he is designing can often help him to avoid pitfalls; it can sometimes show him a way to economize in the design of his castings.

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DIE CAST MAG IN MOTORS, OFFICES, CARS TO BE FEATURE AT OCTOBER MEETING

Featured attraction of the 12th annual convention of The Magnesium Association will be an address by J. P. Walsh, deputy director of Project Vanguard, discussing the selection of magnesium for the skin of the outer space satellite to be launched next year. This information was contained in the preliminary details of the program for the meeting, to be held in Chicago on October 4 and 5, released by Jerry Singleton, executive secretary of the Association.

Headquarters of the meeting will be The Drake, North Michigan Boulevard, Chicago. Two sessions and a luncheon are scheduled for both Thursday, October 4 and Friday, October 5. Morning sessions will begin at 9:30 and afternoon sessions at 2:30.

Die Castings in FH Motors

Among the many papers scheduled for presentation, several are of wide general interest. Representatives of Hughes Aircraft Company will discuss the important new magnesium-thorium alloy in a general survey and evaluation of available data and experience. The increased applications of magnesium in electronics will be presented by General Electric Company personnel. A detailed discussion of the use of die cast magnesium parts in fractional horsepower electric motors is also scheduled.

Other papers slated for presentation include discussions of experience with magnesium in truck bodies, aircraft components and material handling units. Papers describing applications of magnesium die castings in the automotive and office equipment industries are scheduled, too. Speaker at luncheon the opening day will be Buckminster Fuller, who developed and has popularized the method of construction identified as geodesic design. Geodesic domes constructed of magnesium and with plastic covers now are used extensively by the Marine Corps for shelters.

The Annual Convention of The Magnesium Association is open to all who have any interest in magnesium. Full details are available from the executive offices of the Association at 122 East 42nd Street, New York 17.

How To Control Temperature In Die Casting Dies

Part 3 – Water-Cooled Sprue Bushings

By W. M. HALLIDAY

WITH the general run of dies the greatest tendency during their working is for the sprue channel region to become overheated. To avoid or correct this condition requires some relatively sensitive and adjustable control means within the die itself, for increasing the rate of heat dissipation and diffusion.

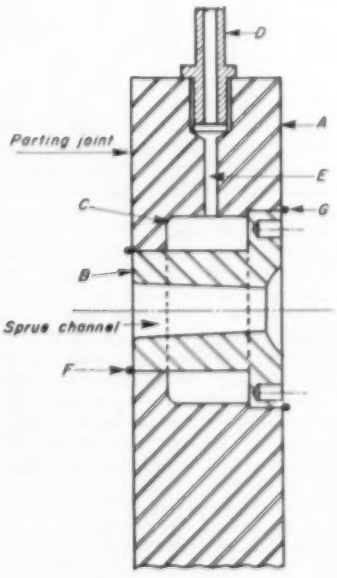
It is not always feasible to regulate this condition by changing the mass of metal in the stationary die-block immediately around the sprue zone. The most common method employed is to provide water-cooling in this part of the die-block; a circulated stream of cool water draws off surplus heat to keep pace with the repetitive heat-inputs occurring from injection.

With a die construction in which the sprue channel is machined directly into the solid die-block, it will generally be extremely difficult to apply such water-cooling provisions. The most efficient, economical and sensitive form of control can be adopted however, where the sprue channel is contained in a separate bushing fitted into the immovable die-block. Much care has to be observed when designing, constructing and fitting such water-cooled bushings, because of other practical requirements to be fulfilled. Some of the latter are illustrated by the following examples which show undesirable features to be avoided, and preferred features to be employed, with such sprue bushings.

A typical simple form of sprue-bush designed with such water-cooling means is shown, Figure 1.

While this is an admittedly simple and inexpensive construction of sprue bushing, very unsatisfactory working service will be obtained. The length of bearing contact between the hole in the die-block and the two end portions of the bush, at each side of recess *C*, is relatively short. In

Continued on page 79



HERE ARE FIVE SUGGESTED DESIGNS OF WATER-COOLED SPRUE BUSHINGS

1. INEXPENSIVE CONSTRUCTION

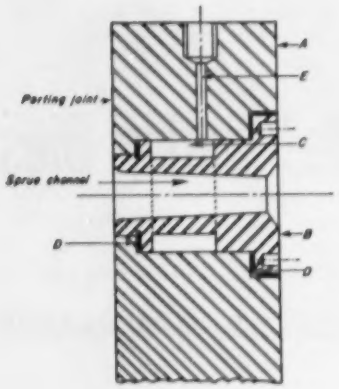
A is a section view of the relevant part of the stationary die-block; *B* is the sprue bush, bored for the tapered channel and having the spherical nozzle seating at one end. Two diameters are formed on the outside of the bush, both of which fit closely into the bored hole through block *A*. An enlarged annular recess *C* is machined in the smallest bore to extend completely around the shank of the bush.

Nipple *D* screwed into the top side of the block connects to a flexible inlet pipe leading from a water supply situated remote from the die. The small drilled hole *E* connects this inlet pipe to recess *C*. A second hole as at *E* is drilled in the adjacent vertical side of the block, connecting the recess *C* with another identical size nipple member, as at *D* and an attached outlet pipe.

In operation, a regulated trickle of water runs down the inlet pipe by gravity, flows into recess *C* absorbing heat, and issues from the outlet pipe as steam. An adjustable valve-type tap is required for close control over the volume of cold water flowing into the die.

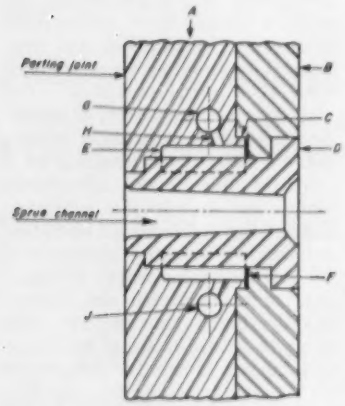
More Designs On The Next Page

MORE SUGGESTED DESIGNS FOR SPRUE BUSHINGS . . .

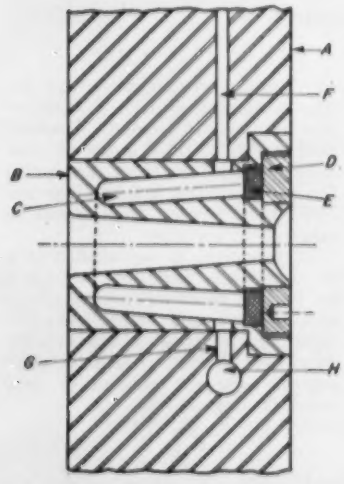


2. LESS LEAKAGE *A* is the fixed die-block; *B* is the bushing whose outside is formed to three different diameters. Each of these is accurately fitted to its matching portion of the hole. Chamber *C* in which cooling water is circulated is reproduced by an annular groove cut around the bush. Copper or lead sealing rings *D* are interposed between the shoulder portions of the bush and the mating steps in the bore of the die-block. When the bush is pressed into the proper endwise position the two sealing rings are slightly compressed to ensure a water-tight joint. Since copper and lead have a higher coefficient of expansion than steel, the tightness of the sealed joints will be increased as the die is heated to the working temperature.

Inlet hole *E* connects to chamber *C*, and a similar size outlet hole is provided in the rear vertical side of the block as with the previous example.



3. FOR THICK DIES In this case *A* is the main die-block, *B* being a stiff back-plate located by the circular spigot/recess formation *C*, and secured by usual set-screws (not shown). These members are bored in line for the triple diameter hole housing a correspondingly shaped bush *D*. The largest bore in block *A* is enlarged from the right-hand end to form the water chamber *E*. Copper sealing ring *F* is situated over the middle diameter and lies between the end of spigot *C* and its mating recess. Cooling water is fed to channel *E* through the cross-drilled large size holes *G* and *J* and the short inter-connecting holes *H*. Holes *G* and *J* are located cross-wise on all four sides of the bush; and the former is the inlet for the cold water supply, while *J* is the outlet leading to a convenient outside edge of the block.



4. FULL-LENGTH COOLING With this construction *A* is the fixed die-block and *B* the bushing, which is of the simple headed kind. The diameter of the long shank portion press-fitted into the die-block should be fairly ample to provide adequate space for the water-cooling recess *C*. This is in the form of a narrow groove cut concentrically to the tapered channel in the bush, and as will be seen, it is located quite close to the sides of such hole. The groove also extends very nearly the full length of the bush. It is started in from the nozzle-seating (right-hand) end of the bush, at which point the member is recessed to a larger diameter and internally threaded for the closure-cap *D*. A thick copper or lead ring *E* is housed in a smaller diameter recess immediately behind the cap D, and seals of the groove *C*. An inlet hole *F* for the cold water feed is drilled through the die-block in line with a matching hole in the wall of the bush leading to the groove formation. At the opposite lower side of the bushing the short outlet hole *G* connects with the horizontal hole *H* through which the heated water passes on its way out of the die after circulating around the bush.

each case such bearing portions lead straight out of the recess. Since a water-cooled sprue bushing is inevitably subjected to considerable thermal stress, distortion is likely to occur. Unless the bushing is made of the same material as the die-block, which is not always the case, the two members may expand and contract at different rates.

Thus the preservation of a water-tight seal on the short bearing portions will be extremely chancy. In working such a sprue bushing there would, in fact, be a great tendency for water to leak out at the points marked *F*.

Such a condition may prove very hazardous. Leakage at the small end of the bush bearing would allow drops of water or steam to run into the cavity and drop onto some core. Unless great care was taken such water could become occluded in the next injected alloy charge, or be trapped by the latter in some enclosed corner of the cavity. It would be instantly converted into steam having considerable pressure, causing serious explosion in the cavity, sufficient to force the die-blocks momentarily open to permit escape of molten alloy.

Leakages at the larger end of the bush allow water to drip onto the injecting nozzle and reduce its temperature, often sufficient to freeze the flowing alloy charge and stop feed to the die.

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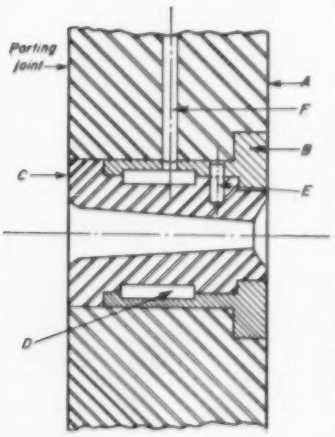

5. TWO-PIECE BUSHING In this case *A* again represents the relevant section of the stationary die-block. The bushing comprises the two sleeve portions *B* and *C*, the former being the larger. These two are press-fitted together, and the inner member is bored for the usual tapered sprue channel. The water-cooling chamber *D* is formed by cutting an annular groove around the outside of part *C* and a similar size of groove around the bore of sleeve *B* so that they match equally as shown. The two bush members are retained in correct relationship together by means of the substantial dowel pin *E* secured in the wall of the inner member. Water is led to the cooling chamber *D* by the inlet hole *F*, and a similar size outlet hole will be required as with the preceding designs.

The circulating water flowing around the internal chamber *D* is prevented from leaking at the ends of the bush members by the closely fitting shoulder/step formations on the two parts.

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These leakage tendencies become greatly aggravated after the die had been operated a considerable time.

A sprue bushing design possessing far less liability towards undesirable leakage of the circulating cooling water is presented in Figure 2.

Another style of water-cooled sprue bush, Figure 3, is specially suitable for use in thick die-blocks; it possesses excellent water-sealing properties.

One drawback with this form of bushing, as also with that at Figure 1, is that the wall of the bush adjacent to the water chamber in the bore of the die-block, is likely to remain too thick for rapid dissipation of heat. This may be simply corrected, however, by means of an annular groove around the shank of the bush and matching the bore-chamber in position, as shown by heavy broken lines, Figure 3.

Another practical limitation inherent in all these three designs of sprue bushes is as follows. The chambering of the die-block bore, or grooving of the outside of the bush necessarily restricts the length of the bushing which can be directly water-cooled. With each of the examples, the length of the critical chamber extends for only about one-third of the length of the bush. This means that the parting-joint and nozzle ends of such bushes may still absorb an undue amount of heat during working, sufficient in fact as to render it troublesome to exert proper and effective control.

This latter rather serious objection is avoided with the design of sprue bushing shown at Figure 4. This follows closely to the conventional shape of bush employed, but is adapted in an unusual manner for water-cooling. The design also possesses the minimum risks of water leakage onto vital surfaces of the die.

Use of a bushing of this kind gives very good service results and the heat variations may be controlled with sensitivity by reason of narrow walls formed between the tapered sprue channel and the water-cooling groove. Furthermore, since the latter groove is blind at the parting-joint end of the bushing there is no risk of water or steam leakage at that critical surface as with the previous bush designs.

The last example of a water-cooled sprue bushing shown at Figure 5, is based upon a very common constructional principle, that of making the bushing in two portions.

Manufacture of this type, or similar two-piece bush constructions—of which there are a variety in regular use—calls for precision sizing and fitting of the respective parts to insure maximum water-tightness between all jointing surfaces.

While this form of bushing offers perhaps the greatest convenience for economical machining of the necessary internal totally-enclosed water chamber, it suffers from one considerable practical disadvantage. This latter drawback does not occur with single-piece bushes of the type described and illustrated earlier. The construction embodies a greater number of critical jointing surfaces and steps, etc., all of

Continued on page 117

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PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

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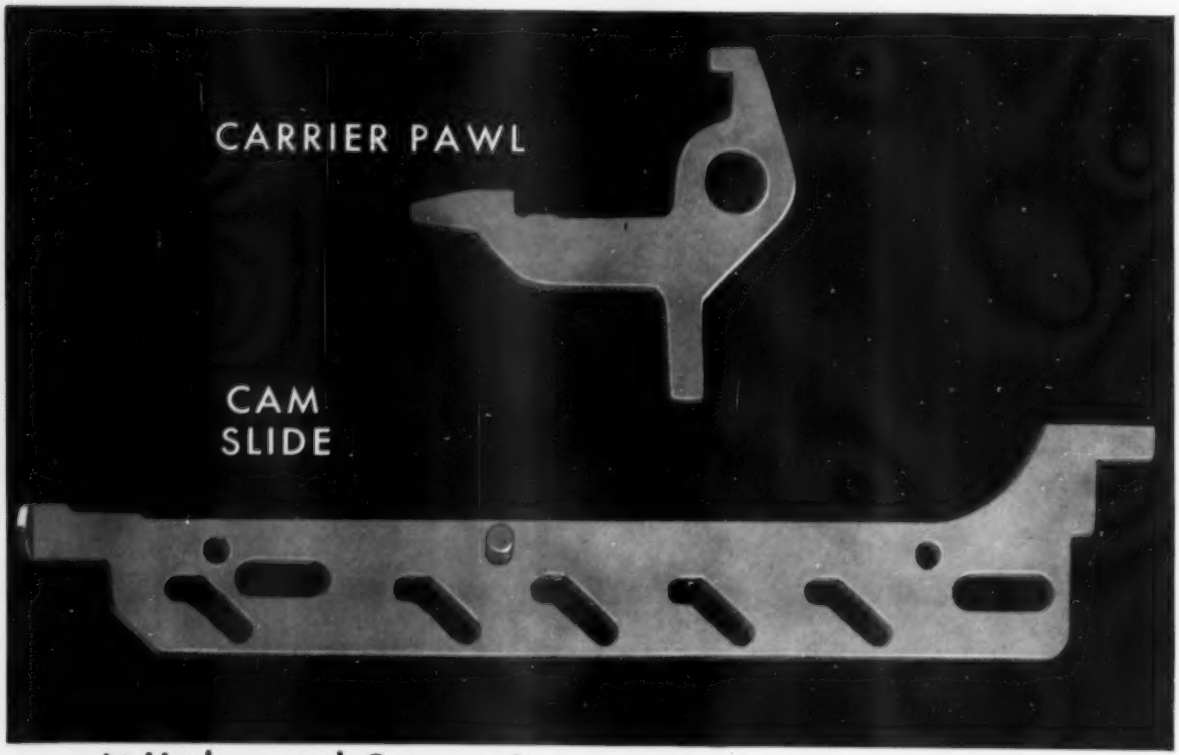

At Underwood Corporation . . .

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CARRIER PAWL About 1,000,000 of these cold-rolled steel parts are made each year. By the old combination of hand-finishing and tumbling methods, it required 15 separate operations to make each pawl — from blank to finish-plated. With the Honite Method, the *total* number of steps has been cut to 6 — with an annual saving on this part alone of $11,750!

CAM SLIDE The sides of this cold-rolled steel part must be exceedingly smooth because they are in direct contact with other surfaces, and tolerances must be held to .002" - .003". The old hand-honing method required 3900 man-hours per year to produce these parts. The Honite barrel finishing method has cut the total annual man-hours to 500!

The average overall cost for finishing parts by the old method varied from $.70 to $1.10 per 100 pieces. With the Honite barrel finishing method costs were cut to an average of $.10 per 100 pieces — a 91% saving. The company's investment in Honite barrel finishing equipment was thus paid off in *less than a year!*

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Finishes: more emphasis on surface treatments ahead

LOOKING AHEAD . . .

. . . Finish sells products, and so you can look for more attention to be paid to type and quality of surface coatings, now that the hard selling days appear on the horizon.

. . . New finishes are being developed that may extend the useful range of die casting applications.

. . . More automatic processing, less hand work, are trends in finishing of die castings, bringing attention to new mechanized polishing, barrel tumbling, painting and plating setups.

MORE die castings get some sort of surface treatment nowadays than did a few years ago. A gain in the application of decorative and protective coatings is clearly shown in a recent study completed by PMM's Market Research Department.

Largest increase, PMM's study shows, has been in the use of chemical conversion coatings, where a 62.5 percent increase has occurred between 1953 and 1956. The survey, based upon the answers of 923 companies to a questionnaire sent out in a five-state area, shows that organic coatings are now used by 67.1 percent of those replying, electroplated coatings by 54.9 percent, chemical conversion coatings by 42.9 percent, anodized coatings by 36.2 percent and vacuum coatings by 5.9 percent.

Reasons for the new emphasis on finish, which is likely to become more marked in the next five years, have been the entrance of die cast components into many types of consumer products where a surface coating is required. Improvements of a technical nature have also influenced many companies to introduce surface treatments. It is possible, also, that government and military buying may have spurred the application of special protective treatments.

While it may be true that the largest tonnage of die castings that are finished get an electroplated treatment, the *largest number of individual plants* reported using organic coatings. Numerically, therefore, paint spray lines are more common than electroplating tanks, although a greater volume of work may be processed by the latter.

What are some of the promising new materials, processes or equipment that may find special application in the finishing of die castings during the next few years? Among the most dramatic potential new finishes is the color anodizing of aluminum, a type of finish that has received considerable attention lately.

Die casters, metal producers and equipment manufacturers have all been interested in the possibility of obtaining a satisfactory anodized coating on die cast aluminum. The possible new applications for aluminum die castings are enormous, but the main drawback has been the development of a suitable alloy that can be both die cast and color anodized.

One of the leading metals producers has an anodizable casting alloy which, however, has not been die castable. The possibility of using new vacuum die casting equipment to die cast is being explored. One of the largest jobbing die casting firms in the country has spent a great deal of effort in working up an alloy and, at last report, believed themselves to be very near the solution to the problem of eliminating the silicon, used to gain fluidity.

A small Eastern die caster has just announced a die castable alloy which he claims to be color anodizing successfully. The first report on this new development is published in this month's PMM. These preliminary findings must be confirmed by production.

The development of a non-porous type of chromium plating (PMM June 1955) has been the subject of considerable interest among users of die castings during the past year, and there are signs that it is gaining acceptance as a protective coating for zinc die castings where durability in the face of severe atmospheric or corrosive exposure is a factor.

A new research project under way at Battelle Memorial Institute under the sponsorship of the American Zinc Institute may find improved decorative and protective coatings for zinc die castings. Besides better electroplated coatings, the Institute hopes to perfect anodic coatings.

Barrel finishing, becoming more and more widely used for the elimination of expensive hand work in finishing die castings, has recently been undergoing a degree of automation. New, complete installations have been introduced which integrate the barrel operation with the flow of parts on the production line.

Along these lines, the modern, bulk finishing and automated finishing processes have also found important new applications for surface treatment of die castings. Electrostatic spraying, hot spray painting (See PMM page 86), automatic polishing and buffing lines, barrel plating . . . have all helped to speed up the finishing of die cast components.

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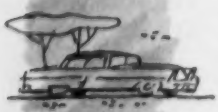

Automobile Hardware

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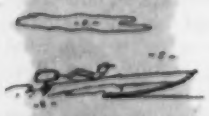

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Either coating provides corrosion resistance superior even to complicated electrolytic treatments in a fraction of the time. These coatings also offer many other valuable characteristics: they have low electrical resistance, they aid in arc-welding, provide a good base for bonding compounds, have no effect on the dimensional stability of close-tolerance parts. Final appearances ranging from clear through yellow iridescence to full brown can be obtained. By dyeing, you can produce red, green, blue, orange or yellow finishes.

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Produces a protective, paint base film with corrosion resistance at least equal to that obtained from long, high-temperature dichromate treatments in a fraction of the time and at room temperature. The appearance of the coating can be varied from light brown to dark brown and black.

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ELECTROSTATIC METHODS INTRODUCED TO GET IMPROVED FLOCKING

FOR decorative coatings or sound deadening, die castings as well as other metal parts are sometimes flock coated. The process of flocking presents a problem in the generation of dust: The finely divided flock tends to become suspended in air and creates a serious housekeeping problem and fire explosion hazard.

To overcome these difficulties and to generally lower finishing costs through reduction of material losses, electrostatic methods of applying flock have been developed. One such system is the "Flockmaster" manufactured by International Industrial Developers, Inc.

In the normal process of flocking the fibers are allowed to fall freely, or are projected by an air stream, onto the adhesive coated object being coated. With this system there is no assurance of any orientation of the fibers and, while a felt-like surface is achieved, the more desirable form of velvet-like pile can not be secured.

When, however, the individual particles of flock pass through a high voltage electrostatic field, they pick up a charge and are automatically oriented so that they strike the part being coated "end-on" to produce a velvet or plush like finish.

The electrostatic unit referred to above is presently available in two modifications. One of them utilizes a Van de Graaff generator as a power source. A potential of approximately 70,000 volts is generated between the flock and the work. With this unit small production runs, laboratory runs, etc. can be made. Production is limited to about 200 pieces per hour.

Where greater production is required, a larger automatic unit has been developed. This machine operates at a somewhat lower voltage (50,000 volts) and is a completely enclosed machine that can be installed in a production line. Overspray of flock is automatically collected and returned to storage to give a completely closed circuit. Humidity is carefully controlled so that treeing is eliminated. Depending upon the material being coated, belt speeds can be varied from 10 to 60 ft. per min. Color change, when desired, is simple and rapid so that down time is minimized.

ALMCO ANNOUNCES NEW, BARREL FINISHING RESEARCH LABS

R. C. Trow, vice president, Almco Division of Queen Stove Works, Inc., announces completion of a barrel finishing research and development laboratory located at Albert Lea, Minn., headquarters for the Supersheen line of barrel finishing equipment and supplies.

Purpose of the laboratory is twofold. First, sample processing of actual parts will be offered free of charge to manufacturers. Second, it provides the industry with latest machines and equipment for barrel finishing research.

This new Almco laboratory features three major types of barrel finishing machines. These types are: standard machines, "submerged" units, and fixture equipment of varied barrel diameters and lengths. Dimensions, diameters and lengths, respectively, include five fixture machines (three 40″ x 48″, one 30″ x 32″ and one 48″ x 48″) — and seven standard machines (two 30″ x 32″, one 30″ x 48″, one 22″ x 24″, two 8″ x 16″ twin barrels, and one 14″ x 20″ twin barrel). The new laboratory also includes a six-station Sub-O-Matic "Submerged" system and three twin barrel machines — two having 8″ x 16″ drums and one 14″ x 20″ drum.

The new laboratory is the central facility for the Almco engineering organization which includes other barrel finishing laboratories and sales offices in Detroit, Los Angeles, Newark, New Haven, and Philadelphia. Recently, plans were completed for an Almco barrel finishing laboratory in London, England.

MORE ANODIZED ALUMINUM ON 1957 CARS

Application of anodized aluminum for automotive trim purposes is increasing steadily. According to a survey conducted under the auspices of Frederic B. Stevens, Inc., leading producers of automatic plating and anodizing equipment, 1957 models will reveal an increasing number of uses of anodized aluminum trim.

Mr. A. B. Hoefer, Stevens vice president, reports, "Speeding the change is the continued tight supply of nickel. Manufacturers have been forced to look for substitutes and like the results aluminum has given them."

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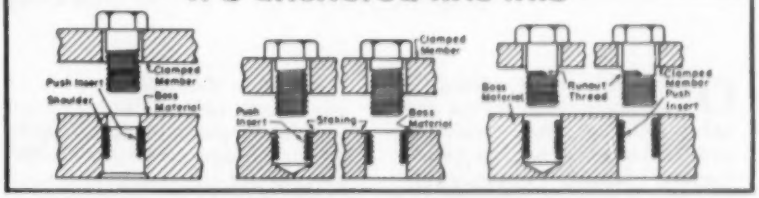

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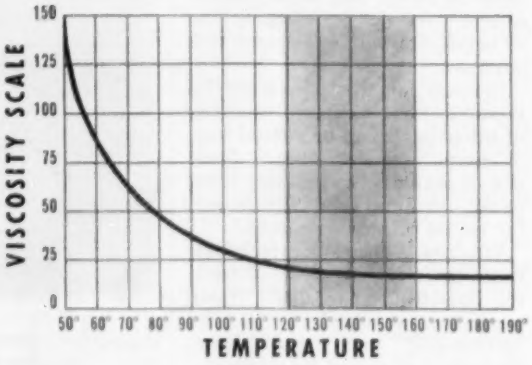
THE FACTS ABOUT HOT SPRAY CHARTED FOR EASY REFERENCE



1. TYPICAL TEMPERATURE-VISCOSITY curve for a sprayable paint. The relatively constant viscosity over a wide temperature range at hot spraying temperatures is shown.

If you heat your paint for spraying, you may find a way to avoid some of your difficult finishing problems. Here are the details about . . .

Hot Spray Painting:

ONE of the most commonly used methods of surface finishing of die castings, regardless of the basis metal, is spray painting. The advantages of this method are well known from both cost and decorative points of view.

The true worth, however, of any spray painting method is the amount and character of the solid deposit remaining on the surface after complete curing and drying has taken place. Depending upon the quality of the finishing job required, one, two or more separate coats of paint must be applied to achieve the required amount of solids in the final deposit.

The very nature of the spray painting operation requires that the paint being applied shall be held within rather narrow viscosity limits. When this paint is sprayed at room temperature viscosity control can only be achieved through the use of thinners; in other words by reducing the amount of total solids per unit volume of paint.

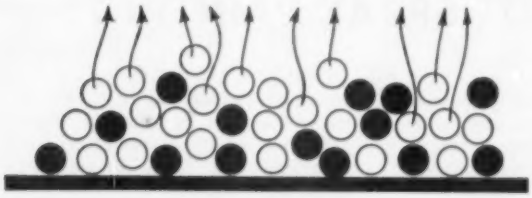
A further disadvantage of trying to control paint viscosity at ambient temperatures is the rapid rate of change of viscosity with temperature, this change is shown in Figure 1, a temperature-viscosity for a typical sprayable paint. The extremely rapid rate of change is quite apparent within the normal factory temperature range of from 60 to 85F. Here the change is from about 85 seconds to 40 seconds. In other words in any working day this temperature change and hence this viscosity change can be expected.

When this relatively large viscosity change is compared with the most desirable viscosity control of 20 to 25 seconds it becomes apparent why large variations in the amount of applied solids can occur during the course of a normal working day.

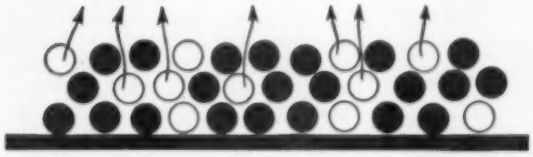
Referring again to the temperature-viscosity curve the very low rate of change of viscosity in the range of 120F to 160F is noted. Here a 40F temperature change produces a viscosity change well within the limits for proper quality control of the spray painting operation. In other words, if paint is held within the temperature range of 120 to 160F at the discharge nozzle of the spray gun the amount of solids per unit volume will be substantially constant.

This same difference in solids content is shown schematically in Figure 2. In this illustration the circles represent solvent and the solid dots pigment. Where the desired viscosity is achieved by the use of thinner and the paint sprayed cold a liquid film similar to that shown for cold sprayed paint is achieved. However, by heating the paint to reduce the viscosity instead of adding thinner and spraying it at the elevated temperature a film similar to the one shown for hot sprayed paint is secured.

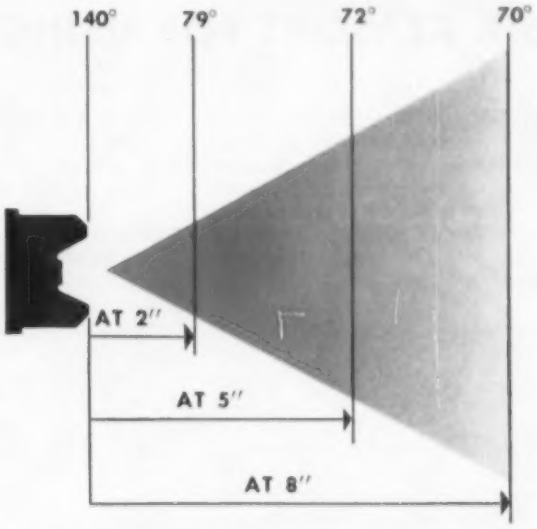
From Figure 2 it is obvious that in the same length of time



2a. SOLVENT-TO-PIGMENT RATIO in a sprayable paint where viscosity control is achieved through the use of a thinner.



2b. SOLVENT-TO-PIGMENT RATIO in a sprayable paint where the same viscosity as in figure 2a is secured by heating the paint. The greater percentage of solids is evident.



3. PAINT TEMPERATURE shown as a function of the distance from the spray gun for a paint heated to about 140 F (discharge temperature). Flash evaporation due to pressure drop and the high temperature is secured in the first inch or two of paint travel.

Illustrations courtesy of The DeVilbiss Co.

How And Why To Use It

and with substantially the same volume of liquid paint a far heavier coating is secured with the hot spraying method of application.

Overcoming runs, sags and blushing

But control of viscosity is not the only advantage that can be gained by heating paint. When moderately large volumes of thinner must be used the problem of runs and sags is a persistent one. Substantially all of the thinner that leaves the nozzle arrives on the work (this assumes no overspray). A paint with a viscosity of only 20 to 25 seconds (based on a No. 2 Zahn Cup) is quite fluid and until an appreciable amount of solvent has evaporated, paint applied to sloping or vertical surfaces exhibits a marked tendency to flow, resulting in runs, sags and thin spots.

If, however, the paint viscosity is adjusted to 20 to 25 seconds at about 140F it will have a viscosity of 40 to 45 seconds at about 70F. This increase in viscosity is sufficient to eliminate, for all practical purposes, the tendency of the paint to run or sag.

But the solvent used in sprayable paints and lacquers must evaporate rapidly at or slightly above room temperatures, before entrance into the oven. If, then, the paint leaves the spray gun at about 140F in the first inch or two of travel a large percentage of the thinner will be flash evaporated. At the same time, there is a rapid drop in paint temperature so that when it impinges on the part to be coated the paint is at ambient temperatures and due to the evaporation of solvent and to the drop in temperature has become extremely viscous. The change in actual temperature within the spray pattern as function of the distance from the gun nozzle is shown in Figure 3.

Another rather common fault with spray painting is the tendency for the lacquered object to "blush" or enameled objects to "bloom". This "blushing", "blooming" or frosty effect is caused by chilling due to solvent evaporation which results in condensation of moisture from the atmosphere on the painted surface.

For all enamels and lacquers there is a critical temperature below which "blushing" or "blooming" will occur. This critical temperature is, for all practical purposes, the dew point temperature of the atmosphere and hence, is strictly a function of relative humidity or grains of moisture per cubic foot of dry air. Typical relationships between ambient (dry bulb) temperature, percent relative humidity and dew point are given in Table 1.

From the table it can readily be seen that at the higher temperatures and higher relative humidity, the conditions most common

SIX REASONS FOR USING HOT SPRAY PAINTING . . .

BETTER FINISH — The improved flow of heated materials produces smoother more glossy finishes with far less tendency for such common problems as orange peel, fatty edges, sags, runs and the like. Better coverage and heavier film builds are attainable.

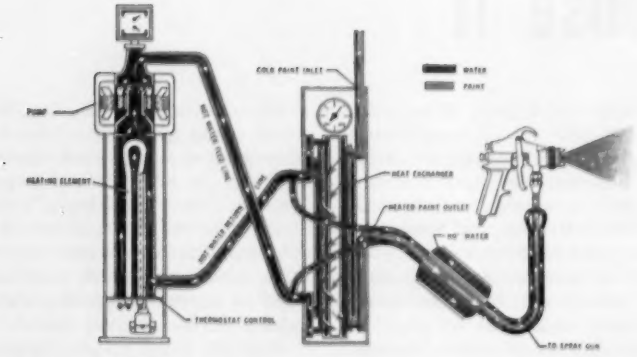
MATERIAL SAVINGS—The cost of materials is reduced in three ways: (1) Waste of paint in the form of overspray or fog is reduced as much as 75 percent. (2) The lower atomizing air pressures used cut air consumption as much as 40 percent. (3) The use of faster acting thinners and smaller amounts of thinners cuts overall solvent costs.

FASTER APPLICATION—Because of the higher amount of solids deposited a heavier film is built up per unit length of time. In many cases a single application of paint is sufficient where two or more were used for cold spray painting.

EASIER SPRAYING—Because of the higher viscosity of the paint and the reduced danger of orange peel and runs the gun speed can be reduced. Particularly on work where the gun is hand held this can materially reduce worker fatigue. With lower gun speeds, more accurate precise work is possible.

REDUCED MAINTENANCE & OVERHEAD—General wear and tear on equipment is lower. Spray booths, exhaust fans and stacks need less cleaning due to reduced overspray and fumes. Pump and gun fouling is lowered materially. Because of the greater number of parts that can be sprayed when only one coat is necessary the overhead costs per piece painted is greatly reduced.

MORE UNIFORM COATING — Because runs, sags, orange peel and other common troubles are materially reduced there is a greater number of uniform and acceptable parts. The lower solvent content with the associated absence of "blush" further increases the uniformity of coating. Atmospheric changes of any sort are of little importance since their effect has been greatly reduced. Further, experience has shown that gun adjustments are less critical since the changes that require nozzle adjustment or pressure adjustment when cold spraying are no longer of any import.



4. TYPICAL PAINT HEATING apparatus is shown schematically, left. This type of unit maintains constant paint temperature almost to the spray gun.

Illustration courtesy of The DeVilbiss Co.

TABLE 1. Temperature, Humidity and Dew Point

Room Temp. Deg. F	70	80	90	70	80	90	70	80	90	70	80	90	70	80	90	70	80	90
% Rel. Humidity	40	40	40	50	50	50	60	60	60	70	70	70	80	80	80	90	90	90
Dew Point Deg. F	43	53	62	51	59	69	56	66	74	59	69	78	64	73	83	68	77	87

through the major industrial areas, the temperature at which "blush" will occur is very little below room temperature unless some special precautions such as dehumidification or air conditioning of the spray painting area are taken.

Through the use of hot spray painting, however, the need for any special precautions such as dehumidifications is virtually eliminated due to the greatly re-

Continued on page 97

HOT SPRAY PAINTING

CASE STUDY

NuTone, Inc. gets the high quality finish it needs for its food mixers by hot spraying alkyd resin paint over phosphate treated zinc die castings.

A TYPICAL hot spray finishing operation that has replaced the former cold spray system is installed at NuTone, Inc. In this installation aluminum die castings used in food mixers are painted.

Prior to painting, the castings are degreased with an alkaline degreasing and cleaning agent followed by a thorough rinse, a phosphate conversion coating, another rinse and then force drying completes the pre-treatment.

The work to be painted is loaded on rotatable spindles as shown in Figure 5 and passes into the spray booth. At the entrance to the spray booth the cycling cam which controls the action of the automatic spray guns is located. This cam is driven by the chain conveyor that carries the work spindles. This cam is shown in Figure 6. Also in this figure the "V" belt drive that is used to rotate the work spindles can be seen. Positioning of this belt is such that rotation of the spindle starts just prior to the piece passing in front of the spray gun and is stopped just before the spindle leaves the booth.

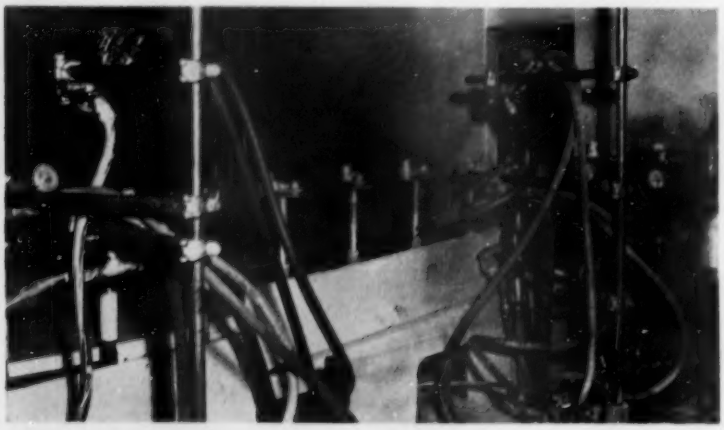
5. DIE CAST MIXER PARTS are loaded onto the rotating spindles, moving along a continuous conveyor line through spraying, drying and baking, and back to the unloading station. Total cycle: 20 minutes.

Use Modified Alkyd Resin Paint

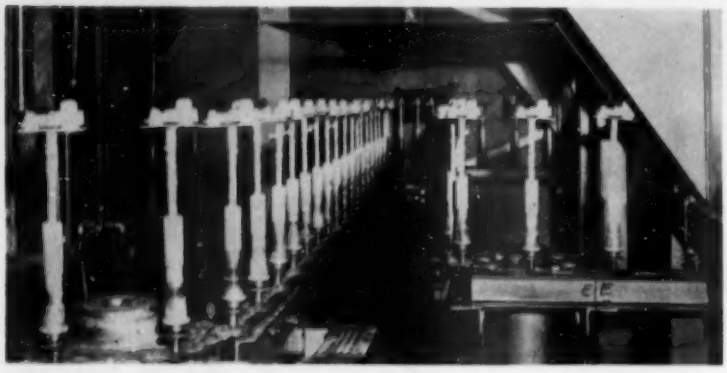
Depending upon the size and shape of the part to be sprayed, from one to four or more spray guns may be used, Figure 7. All of these guns spray a modified alkyd resin paint containing a high percentage of wax to give the finished surface greater mar resistance. The paint is heated to 150F in the lines and discharges from the spray guns at from 120F to 130F. At these operating temperatures the paint has a viscosity of between 20 and 25 seconds, equivalent to a room temperature viscosity of 40 to 45 seconds. Relatively low atomizing pressures are used.

By proper adjustment of both the spray nozzle and the distance between the gun and the work

6. INDEXING CAM, driven by the chain conveyor that carries the work spindles, controls the action of the automatic spray guns.



7. TWO SPRAY GUNS in a single water-wash booth give complete paint coverage on the castings mounted on rotating spindles. Only one spraying operation is needed due to the high solids content of the hot sprayed paint.



8. SOLVENT EVAPORATION takes place on this drying leg of the conveyor. Here, the solvent evaporates at room temperature before the work enters the baking oven.

9. WORK IS UNLOADED from the work holding spindles. Only two men per shift are needed to operate the complete spray painting line.

the amount of over-spray has been greatly reduced as compared with the overspray when cold spray methods were employed. Under normal operating conditions the over-spray is 25 percent or less, a marked reduction compared with cold spray applications.

When the painted work leaves the spray booth there is still a small amount of residual solvent that should be evaporated before drying. An air drying leg is, therefore, put into the conveyor line, as shown in Figure 8. Because of the small amount of vaporizable solvent left in the paint this leg is considerably shorter than would be necessary with paint that has been cold sprayed.

Total cycle: 20 minutes

Final drying and curing of the particular paint used in this setup requires 15 minutes at 350F. The painted parts, still on their spindles are conveyed through a circulating warm air oven and emerge onto a moderately long cooling leg. Finally the finished parts are unloaded at a station adjacent to the loading station Figure 9.

The entire cycle from loading to unloading is 20 minutes of which only 5 minutes are consumed in all operations other than baking.

In this finishing cycle, a single pass using heated paint is now used instead of a double pass formerly employed. Less material is used, over-spray is reduced, labor charges are lowered and the number of rejects has been drastically cut.

Surface imperfections in the casting which formerly required sanding or buffing to remove can often be left because of the heavier film of paint that is applied by the hot spray method.

Installation costs for a system such as that in use at NuTone, Inc. are no higher, if as high, as the costs for a cold spray system to turn out the same number of acceptable finished parts.

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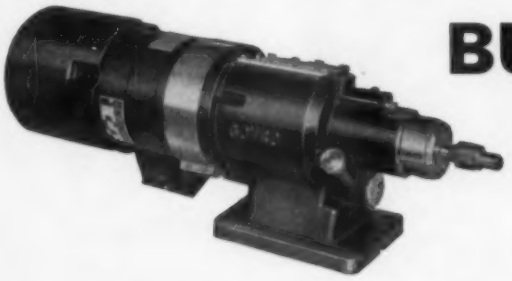

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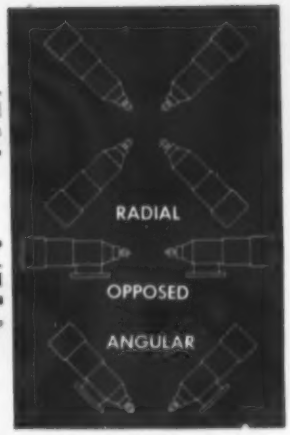

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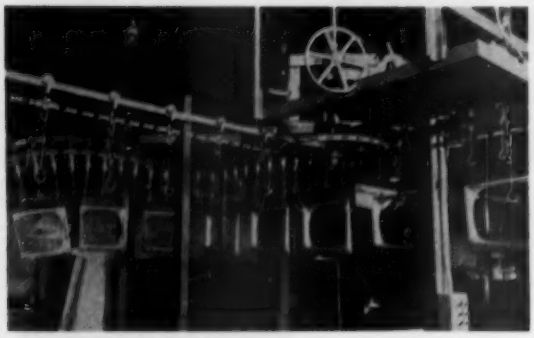
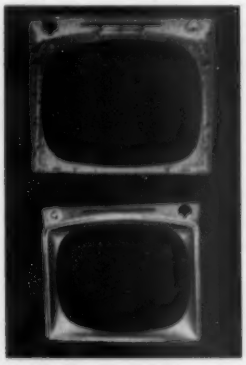
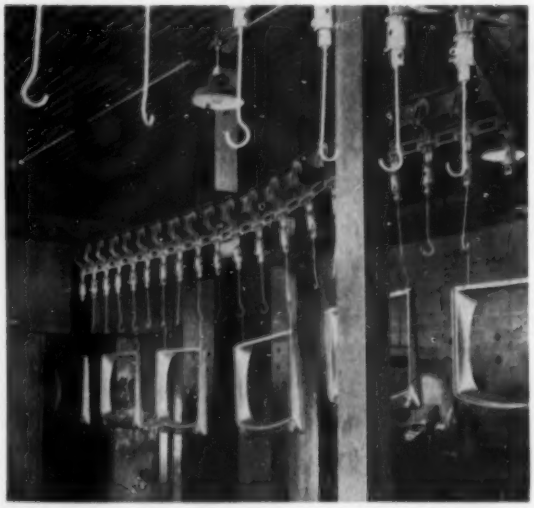


PHOSPHATED BEZEL CASTINGS are shown here on the way from the drier to the paint finishing line.

OPAQUE GOLD LACQUER is sprayed by two men using Binks guns as the bezels move along on the conveyor.



8-POUND ZINC die casting, designed to hold the entire set chassis, is shown in two views.



FROM THE BAKING oven comes the line of finished bezels, ready to be packed and shipped to the assembly plant.

Gold Finished TV Bezels . . . 600 Per Shift

BY JACK H. GOODYEAR
Vice President, J. W. Rex Company

ALTHOUGH they surround the screens of the country's more than 35 million television sets, the *bezels* rarely rate a second glance. These sloping "picture frames" are often stamped out of thin sheet steel, given an attractive finish, and then assembled in the cabinet as a separate element just to serve as a border for the picture tube.

In the new 21-inch CBS television set, however, CBS engineers have designed the bezel to serve as a functional *structural* element, as well as for attractive appearance.

The new bezel is designed as a one-piece zinc die casting, built to house all controls and to support the entire weight of the television set chassis and picture tube.

Applying an opaque gold baking lacquer finish to the die cast bezels calls for precise preparation and modern finishing tech-

niques. Because of the intricate detail — the fittings and supports which must be built into this one-piece, 8-lb zinc die casting — cold shuts formed during casting become a problem. Before the actual finishing cycle begins, therefore, the castings must be given a surface treatment for elimination of these imperfections. A smooth, even metal surface is required in order to get a uniform gold finish.

Jersey Plastic and Die Casting Co., makes the zinc castings. After the gold finish is applied to the units, the finished bezels are delivered to CBS Columbia for assembly.

Before J. W. Rex Company, Lansdale, Pa. entered the picture, two other finishers were already at work on the bezel painting contract. Four days after Rex went into production, however, the Pennsylvania firm became the primary finishing source.

Production of the bezel contract is handled by the company's Del-Val Finishers Division.

The first day of production on the bezels, the Del-Val line ran at 25% production. In one week, production was jumped to 50 percent. At the end of the second week, the line was running at 100 percent production — turning out 600 gold-finished bezels per 8-hour shift.

To facilitate handling and to keep production running at capacity, the company added a new, separate conveyor line for priming.

Packed in Kimpac to protect the gold finish, the painted bezels are delivered to the assembly plant in New York.

From start to finish, the bezels receive a careful, thorough finishing treatment and 100 percent inspection. This procedure has paid off in a very low reject rate. In a total run of 18,000 bezels, *reject rate ran only 0.7%.*

The 300-foot paint spraying and finishing line is laid out so that the finished bezels end up at the same point where they begin the journey. An efficient arrangement of continuous overhead conveyors automatically moves the castings from stage to stage throughout the process. The gold-finished bezels are unracked and packed at the original racking point.

For the 12 steps in finishing these TV bezels, see page 95

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Oakite ChromiCoat Process offers unusual economy. Dilute water solutions, 2–3 oz/gal., give you a low make-up cost. Easy control, with no pH problem, reduces upkeep and operating costs. You can use dip tank method or pressure-spray washing machine.

Oakite ChromiCoat Process fully meets specification No. MIL-C-5541.

Oakite ChromiCoat Process is another example of how Oakite research seeks constantly to meet the special needs for cleaning and processing in every industry. And nearby is your local Oakite Technical Service Representative to help you make the most efficient and economical use of Oakite materials. Call him.

For more details on Oakite ChromiCoat Process, write for Bulletin B4728 to Oakite Products, Inc., 54 Rector Street, New York 6, N. Y.

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Here is a 12-step cleaning and finishing cycle...

From initial surface preparation to final inspection, the castings travel through 12 distinct finishing steps:

1. **Grinding and polishing** with a 7½ hp, 62" spindle, double-head Hammond variable speed buffer to remove cold shuts, mars, scratches, or any other surface imperfections.
2. **Cleaning** with Oakite Cryscoat 87 alkaline cleaner.
3. **Phosphating** with Oakite Cryscoat SW. Inherently, in zinc phosphating, the tendency is to get a large crystalline formation. On the CBS contract, however, Rex modified the bath in order to get a fine, uniform phosphate crystal on the bezel surface.
4. **Drying** of the phosphate-coated castings in a Rex-designed gas-fired, recirculating dry-off oven to prepare the bezels for priming. Time in the 18-foot oven is governed by a conveyor speed of 5 feet per minute.
5. **Tack ragging** to remove any foreign materials.
6. **Priming.** The bezels are transferred from the main conveyor line to the separate conveyor line specially installed for the priming treatment. Then they are hand-sprayed with Binks guns with a baking primer surfacer.
7. **Baking** in a oven for ten minutes under infrared lights.
8. **Inspecting** for appearance — for cold shuts, scratches, mars, imperfections. Any bezels found with a faulty finish are hand sanded and, if necessary, rerun.
9. **Tack ragging** again, after which the bezels are rehung on the main conveyor line for further processing.
10. **Spraying on finish.** Two operators using Binks hand guns spray bezels with Rexton Finishes opaque gold baking lacquer.
11. **Baking** for 6 minutes at 325 F in a 30-foot Cincinnati baking oven of Rex-modified design. Time in oven is governed by conveyor speed.
12. **Inspecting.** Finished bezels receive a 100% inspection.

Toward the end of the 18,000 run, CBS set designers ordered a minor model change requiring certain variations in the bezel finish. While the main body of the die cast bezel front was to retain the same opaque gold lacquer finish, the raised trim bordering the sloping bezel edge now called for a polished gold highlight.

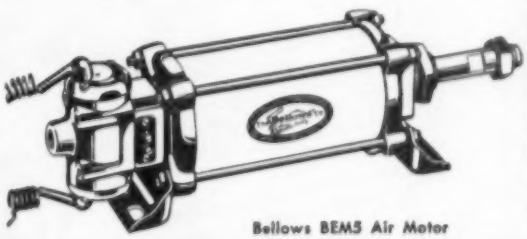
This model change necessitated several variations in finishing line procedure. The initial steps of grinding and polishing (1), cleaning (2), and phosphating (3) remained the same. Following phosphating, however, the following additional steps were included:

(a) buffing and polishing of trim
(b) applying transparent gold finish to polished surface
(c) baking for 10 minutes at 325 F

After baking, the finished trim was masked, and the operation followed the regular procedure.

LEA OPERATION GROWS

The Lea Manufacturing Co., Waterbury, Conn., manufacturer of abrasive materials and electrochemical processes, is now operating the third section of its large new plant being built on Aurora St., Waterbury. The new location covers 14 acres and offers a rail siding plus large truck docks for better shipping facilities.



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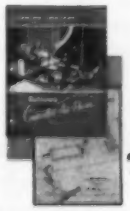

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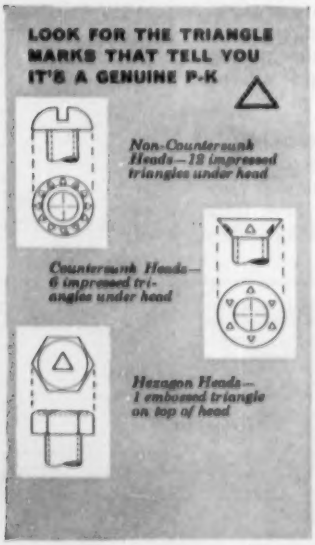
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ALUMINUM PRODUCERS SET RECORD IN FIRST HALF

Figures released by Donald M. White, secretary of The Aluminum Association, show that the total primary aluminum output of 1,720,607,779 pounds for the first half of 1956 established a new production high.

The new record represents a 13 percent increase over last year's production of 1,519,733,010 pounds in the same period. The 1956 second quarter output of 882,505,193 pounds also topples the all-time record set in the first quarter of this year (838,-102,586 pounds). Primary production figures for June are 291,-452,517 pounds compared with 301,600,064 pounds in the preceding month and 255,265,003 pounds in June of last year.

According to secretary White, the primary producers are almost certain to surpass their production record for the fifth year in a row. Producing facilities have increased by more than 200 million pounds since January and still more are slated for completion before the year-end.

FORM METALS DEPARTMENT

Formation of a department of metallurgy at Stanford Research Institute, Menlo Park, Calif., has been announced by Dr. Donald L. Benedict, director of physical sciences research. Chairman of the new department is Rudolf H. Thielemann, a specialist on high temperature alloys, refractory metals, titanium and nuclear reactor metallurgy.

New facilities are now available at the Institute for metallurgical research, such as equipment for melting, creep testing, and for high vacuum studies. Present programs in metallurgy at SRI are primarily concerned with high temperature alloys, liquid metallurgy, corrosion, and electrochemistry.

BUILD PLANT ADDITION

The completion of a new $14-million shipping and warehouse area on the rear of their die casting plant has been announced by Du-Wel Metal Products Co., Bangor, Mich. The 2500-sq. ft. building is of cement block construction and was added primarily to permit storing of finished parts in advance of customer requirements.

HOT SPRAY

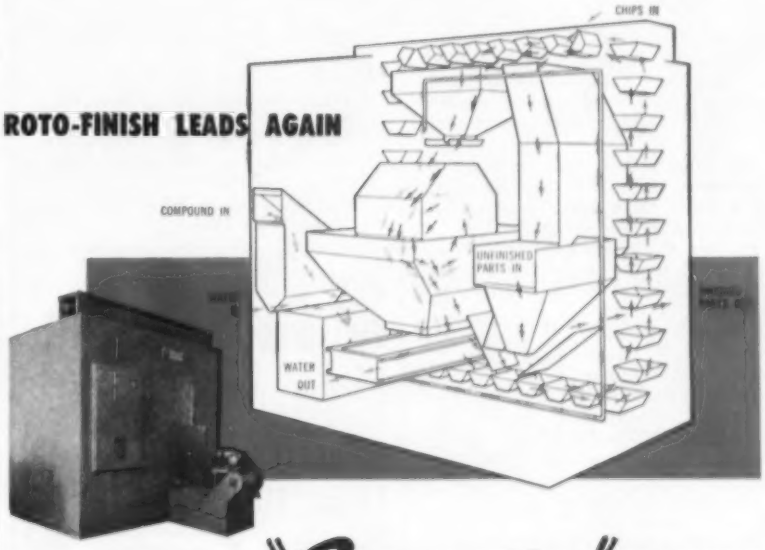
continued from page 88

duced quantity of thinner or solvent in the paint. This applies, of course, to the paint at the nozzle. As noted above there is flash evaporation of the lower boiling point solvents due to the high temperature and this amount of solvent loss can not be accurately evaluated.

The net result, therefore is that a paint of say 50 percent solids and an initial viscosity of about 50 seconds will, at the moment of impact on the part being painted, have considerably higher amounts of solids and a higher viscosity; thus the cause of "blush" is largely removed since there will be insufficient solvent left in the paint to lower the temperature of the work surface to the dew point of the air.

A variety of different schemes are utilized to heat the paint. One major factor to be considered is that heating must be carried as near the gun nozzle as is possible. The system shown schematically in Figure 4 utilizes circulating hot water to preheat the paint and to maintain it at an elevated temperature up to the spray gun. Such a system as this one is entirely self-contained and needs only an electrical connection, in addition to the usual ones for air and the paint, to be operative. The water temperature is thermostatically controlled and the unit has a built-in circulating water pump.

ROTO-FINISH LEADS AGAIN



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SLIP CASTING

continued from page 66

therefore the results were not always reproducible. Additional development work on this process should provide the answers required in order to produce consistently good material.

ACKNOWLEDGMENTS

The authors wish to express their appreciation to Eugene P. Larson for furnishing the results obtained from initial experiments conducted on slip-casting of metal powders.

This work was supported by U. S. Atomic Energy Commission Contract AT-30-1 GEN 366.

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MASK WASHING MACHINES
50% faster than any other make. Cut solvent consumption. Avert production delays due to damaging of masks by hand scrubbing.

CONFORMING MATRIX CORPORATION
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HIGHER LUSTRE IN BARREL TUMBLING FOR ZINC DIE CASTING

You can save as much as 90% in time in barrel processing zinc and aluminum die castings with specially developed **PERMAG** compounds.

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It will save you time and money. It takes only 45 minutes with but 1/3 of an ounce per gallon of **PERMAG #338**, to do a superior job on a barrel-load of zinc and aluminum die castings. For far better jobs, investigate the many advantages of **PERMAG #338**.

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Satisfactory results in your deburring operations are possible with **PERMAG #370**, specifically developed for barrel deburring of all metallic parts. **PERMAG #370** is efficient, economical and also useful as a rinsing agent.

Write today for samples and complete data on these and other **PERMAG** compounds, or for the assistance of **PERMAG** technicians on any tumbling or cleaning problems you may have.

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M.P.A. SCHOLARSHIP

The Metal Powder Association has announced as winner of this year's $500 M.P.A. scholarship in powder metallurgy: Horace Pops, a junior majoring in metallurgical engineering at Rensselaer Polytechnic Institute, Troy, New York.

Horace Pops

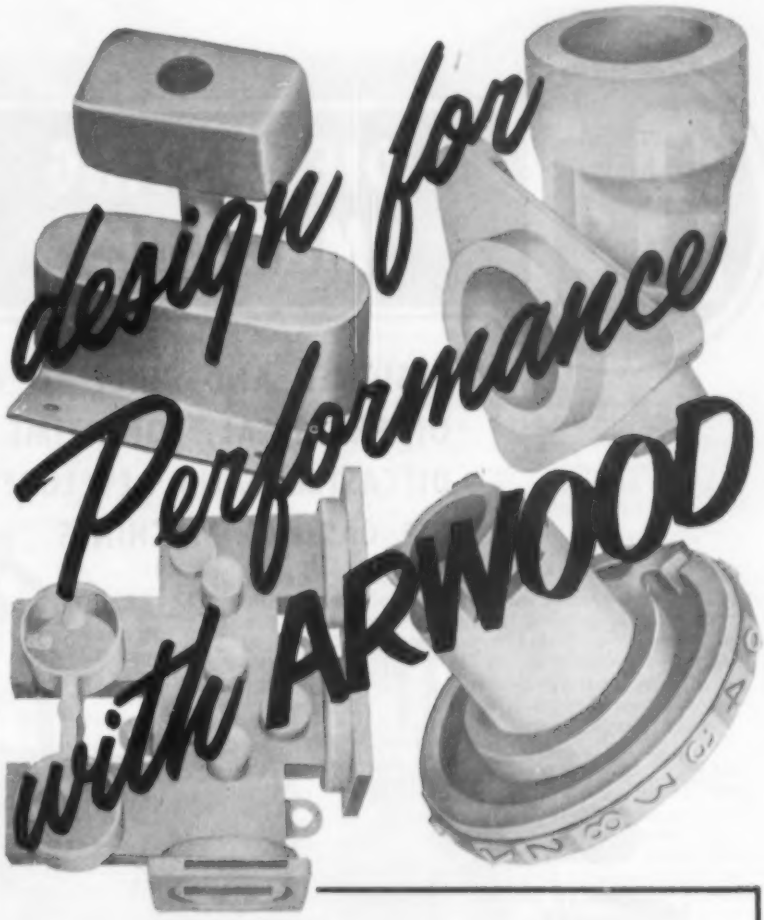
This marks the second year the Metal Powder Association has awarded its scholarship established to encourage engineering students to specialize in powder metallurgy in order to help fill the need for trained personnel, and to give a deserving student an opportunity to follow a pursuit with a promising future. The metal powder industry has expanded so rapidly in recent years, that this approach was selected by the Association as one means of helping to meet these needs.

The scholarship was available to any student majoring in metallurgy who was completing his junior year in an accredited university or college, and who had intended to pursue one or more courses in powder metallurgy. In lieu of the latter, a senior thesis on a powder metallurgy subject based on laboratory work was considered as a substitute. The $500 scholarship applies to the 1956-57 school year.

Mr. Pops is 20 years old and is a graduate of Jamaica High School, Jamaica, New York. He has been working under the direction of Dr. Fritz V. Lenel, the institute's authority in the field of powder metallurgy.

P. V. FARAGHER RETIRES

Dr. Paul V. Faragher, chief of the specifications section of Aluminum Co. of America's metallurgical division, has retired after 37 years of service. Dr. Faragher is nationally recognized as an authority on the establishment of standard specifications for light metals.



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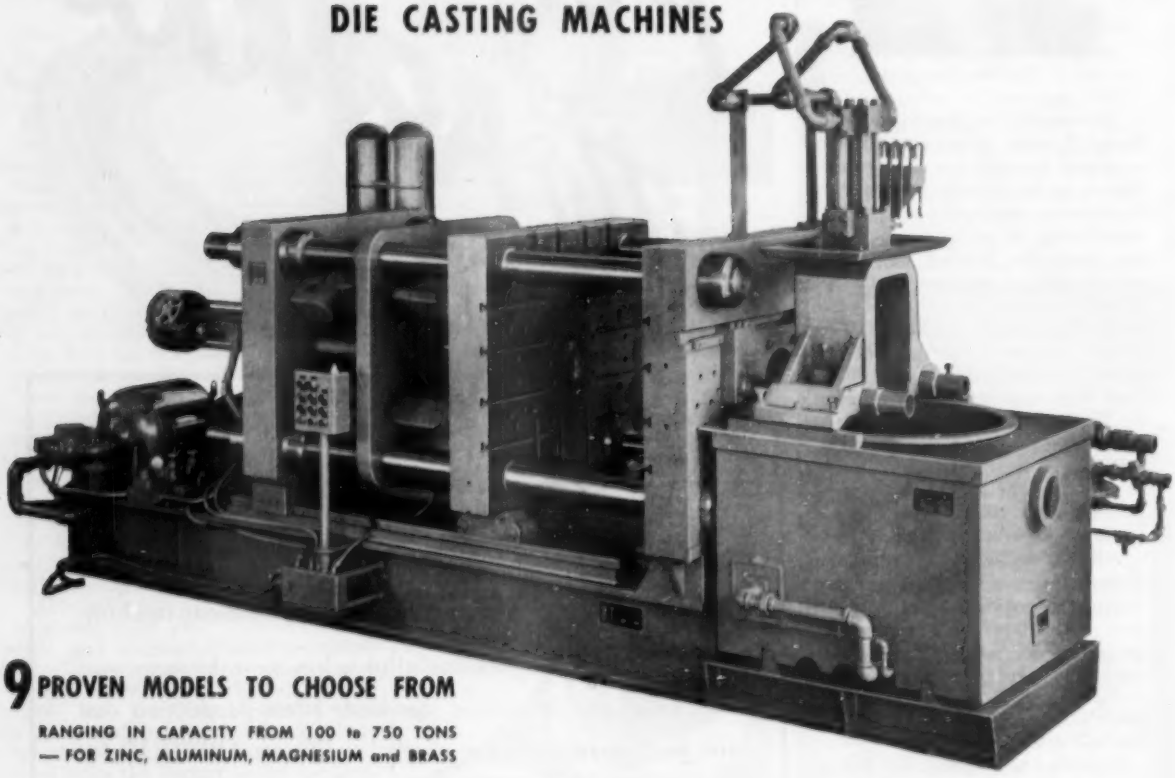
B&T DIE CASTING MACHINES

DESIGNED AND BUILT TO THE SPECIFICATIONS OF PRACTICAL, LONG-TIME DIECASTERS AND DEVELOPERS OF DIE CASTING MACHINES



9 PROVEN MODELS TO CHOOSE FROM

RANGING IN CAPACITY FROM 100 to 750 TONS — FOR ZINC, ALUMINUM, MAGNESIUM and BRASS

B&T die casting machines operate with four extra heavy alloy steel casting toggles that lock directly under the tie bars. The hydraulic lines are of extra heavy seamless pipe; Weldon joints, flanged connections and "O" ring seals on pressure lines. Full specifications on all models furnished upon request. Consult with us on your requirements.

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For more information circle No. 16 on the Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

any of these technical publications may be obtained by circling the appropriate numbers on the Reader Service Cards, Pages 16-17

PRODUCERS

Powder Metallurgy Guide: 154
Amplex Div., Chrysler Corp., 52-page engineering manual No. E-56. The book is thoroughly revised from previous years and contains complete details about Oilite products, including data on properties of Oilite materials and Brinell and Rockwell ratings for the materials. The manual also contains a special 12-page insert which lists more than 1,000 standard Oilite products available for shipment in any quantity.

Aluminum Handwheels: 155
Die Casting Development & Mfg. Co., 2 pages, 2-color specifications folder. Price quotations and specifications tables on the company's die cast handwheels are given in the folder. The handwheels are said to have high torque and impact resistance. Available at no extra charge in either radius ground rim or modern turned and knurled rim, the wheels have a hub machined to the customer's print.

Die Casting Facilities: 156
The Accurate Die Casting Co., 40-page, 2-color brochure. This illustrated brochure tells about the facilities and services offered at the company plant. Photographs of the plant departments as well as the available materials and equipment are featured. Also included are specification data charts on various casting alloys.

Permanent Mold Castings: 157
Alcaloy, Inc., 5-page, 2-color folder. Principal advantages and properties of chain, fittings, and accessories cast by the company are disclosed. Nominal composition of Alcaloy copper-base alloys and mechanical properties of the permanent mold castings are presented in tabular form.

Powder Metallurgy Service: 158
Asco Sintering Co., 1 page, 2-color sheet. The company's powder metallurgy parts service is presented in this sheet. Among the parts discussed are sinterings, bronze or iron bearings, "Micropor" filters, and machine parts.

Investment Casting Process: 159
Haynes Stellite Co., 40 pages, 2-color brochure. This book is designed to help in determining how to use the investment casting process to best advantage. An illustrated description of the process is offered. A section on design and complete specifications of the alloys used in producing Haynes castings are included, as well as the numbers of the Aeronautical Material Specifications to which they conform.

MATERIALS AND EQUIPMENT

Aluminum Alloys Properties: 160
Apex Smelting Co., 15-page technical brochure. This up-to-date brochure gives the composition, typical mechanical properties, and heat treatments of the standard aluminum alloys currently produced by the company. Standard testing methods of the American Society for Testing Materials were used on regular production heats to obtain the typical values listed.

Ramming Mix for Aluminum Furnaces: 161
Mexico Refractories Co., 2 pages, 2-color sheet. Important data on the company's new hydraulic-setting ramming mix for aluminum furnaces are revealed. Installed as a solid lining, the mix cannot be wet by molten aluminum, thus preventing penetration and metal-refractory reactions.

European Furnace Progress: 162
Ajax Engineering Corp., 7-page technical report. This paper lists the characteristics and typical installations of coreless line frequency induction furnaces now being used in European foundries. Cross-section diagrams, tabular data, and photographs support the reading matter. This type of furnace is used for melting aluminum, magnesium, steel and cast iron.

Base Blocks, Furnace Covers: 163
Crucible Manufacturers' Assoc., 3-page leaflet. This latest in the series, "Getting the most from crucible melting," deals with selection of furnace base blocks, and various types of furnace covers. Cutaway diagrams are used and the material is presented in detailed outline form.

Self-Locking Fasteners: 164
The Nylok Corp., Catalog 11-B. The complete line of self-locking fasteners made by the company is presented. The fasteners are based on the use of a nylon pellet inserted into the threaded area of the fasteners. Complete specifications and sizes for the company's screws, bolts, and nuts are included in the catalog.

Versatility in Heat Treating: 165
Surface Combustion Corp., 2 pages, 2-color bulletin. A description is given of the Allcase batch type furnaces which have an operating range from 1400 F. to 1750 F. and can be used in gas carburizing, clean hardening, dry cyaniding, carbon restoration, etc. Illustrated are suction type, gas or oil fired radiant tube units and the available mechanized All-case systems.

Die Casting Machines: 166
Kux Machine Co., 34 pages, 5-color catalog. The various sizes and models of the company's die casting machines are presented. Photographs and complete specifications of each model are included and operation of typical die casting machines is shown by means of numbered parts.

Lists of Studder Parts, Prices: 167
E. V. Nielsen, Inc., 2 tabular sheets. These sheets contain parts and price lists for a new studder that drives and extracts studs at high speed without damage. The parts list provides parts numbers for each of the five studder models manufactured by the company and the price list gives prices for each model in addition to prices for all parts.

Continued on page 102

DIE CASTINGS in the new LIGHTWEIGHT ALLOYS may be YOUR SOLUTION

Fluctuating prices in both ferrous and non-ferrous metals may be pricing your product out of the market. For example: the Yard Light Reflector shown here formerly cost 30% more when made from non-ferrous metals before given to LITEMETAL for die casting. One of the advantages offered by LITEMETAL allows the alternate use of magnesium or aluminum, whichever is most competitively favorable for the product as governed by metal market prices. Both of these alloys are mechanically strong and permit wide scope for the product designer. Important in the effecting of cost savings through die casting is the virtual elimination of machining operations . . . also, the light weight of the product lowers shipping costs.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

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PLANT AND EXECUTIVE OFFICES

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USEFUL LITERATURE

continued from page 101

One-Shot Lubricators: 168
Bijur Lubricating Corp., 2-page, 2-color service instruction sheet. Service information and operating instructions are provided for built-in "One Shot" lubricating systems produced by the company. The lubricator is a spring discharge piston pump mounted in a reservoir on the machine.

Standards Index: 169
American Standards Assn., 56-page index book. This book contains the index of 1600 American Standards, including 152 for mechanical engineering. Among these are: screw threads, small tools and machine tool elements, bolts and nuts, pipe flanges and flanged fittings, iron and steel pipe, mechanical refrigeration, etc.

Colloidal Graphite Dispersions: 170
Acheson Colloids Co., 4-page, 2-color news sheet. The latest issue of "The Acheson dag disperser" presents a detailed discussion of the properties of 'dag' colloidal graphite. Some of the unique applications of the material are shown.

Shell Core Blower: 171
Shell Process, Inc., 4 pages, 2-color illustrated folder. A description of the Chicopee Core Chief, a new shell core blower, is given in this sheet. Specifications, including engineering diagrams, are presented as well as photos of other equipment produced by the company.

Industrial Hose, Fittings: 172
Aeroquip Corp., 10 pages, 2-color catalog-bulletin No. 174. This specifications catalog contains information on the company's standard industrial products and is designed primarily for use in the replacement field. It includes instructions for ordering, installation planning, and assembly of hose and fittings. A list of the company's other products, including fire-resistant hydraulic fluid hose, is also given.

Mold Price Revisions: 174
Detroit Mold Engineering Co., 1-page, schedule sheet. A new schedule of the company's price discounts for its various standard mold parts has been released.

Reclaiming Hot Forge Dies: 175
Haynes Stellite Co., 3-page, 2-color folder. Methods of reclaiming worn forging dies through use of "Hastelloy" Alloy C are discussed in this folder. A summary of the characteristics of Alloy C is given as well as specifications tables for the "Hastelloy" electrodes.

Precision Lathe Fixture: 176
Universal Vise & Tool Co. 4 pages, Catalog LF56. A new catalog describing in detail the company's adjustable precision lathe fixture is now available. Complete specifications and prices are included.

Self-Tapping Screws: 177
Set Screw & Mfg. Co., 28 pages, Catalog No. 21. Every type of standard set screw and many special types are listed and described. The special types, which include self-tapping set screws, are manufactured to meet special conditions, of vibration, close precision setting, resistance to tampering, chemicals or heat, need for increased holding power, etc.

Tool Steels For Casting: 178
Darwin & Milner, Inc., Products bulletin. This bulletin

lists the company's complete line of tool steels, including PRK-33, Darwin No. 1, Neor, Mineor, OHT, "MT6," and various grades of hot work specialty steels. The steels are furnished in bar stock, billet and sand casting, drill rod, flat ground stock, and tool bits.

Aluminum Alloy Data:
Aluminum Co. of America, 176 pages, reference handbook. Entitled "Alcoa Aluminum Handbook," this manual presents data on aluminum alloys and mill products in tabular form. The book's 140 tables contain information on alloy standards as well as the properties, sizes, and tolerances of mill products usually produced from them. The introductory section explains the code numbering system for alloys and their modifications. Requests must be sent on company letterhead to: Aluminum Company of America, 781 Alcoa Bldg., Pittsburgh 19, Pa.

FINISHING

Multi-Barrel Tumbling Unit: 179
BMT Manufacturing Corp., 8 pages, 3-color brochure. Castings, metals, plastics, and parts of all kinds previously considered impractical to finish in tumbling machines are said to be successfully handled by a new multi-barrel slide-honing unit. As described in the brochure, the equipment is a multi-barrel unit with a revolving disc on which can be mounted as many as 14 different barrels.

Barrel Finishing Equipment: 180
Almco Div., Queen Stove Works, Inc., 52 pages, 2-color manual. The first section of this manual contains an explanation of barrel finishing and the variables involved. A detailed, illustrated discussion of the company's sample process laboratories is given. The latter part of the manual includes barrel finishing machines, accessory equipment, media and finishing compounds.

Water-Mixed Machining Lubricant: 41
Fiske Bros. Refining Co., 1 page, 2-color leaflet. A description is given of a compound which, when dissolved in water, is suitable for any machining operation where a water solution is desired. General recommendations by the manufacturer as to dilutions of the lubricant are included on the sheet.

Chromium Process For Steels: 182
Chromalloy Corp., 4-page, 3-color folder. This folder describes the advantages of high temperature diffusion of chromium into the surface of steel parts to increase their heat, wear, and corrosion resistance.

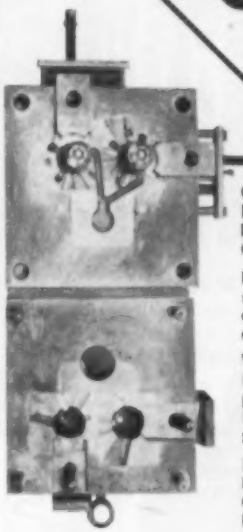
Automatic Plating Machines: 183
The Udylite Corp., 4-page, 2-color pamphlet. Operating advantages and distinguishing features of the company's automatic plating and processing machines are presented in line drawings and diagrams. The pamphlet also provides a check list for anyone who is thinking of buying automatic equipment.

Chromium Plating Additive: 193
Chromium Chemicals Div., Diamond Alkali Co., 4 pages, 3-color fact-file folder. Besides serving as a convenient filing folder for technical service bulletins and related data, this folder gives a concise review of a recently developed chromium plating additive for both decorative and hard-chrome applications. Supplementary technical data, presented in chart and graph form, deals with composition of plating solutions of the above types using this additive, range of deposits obtained, and effect of current density on plating speed.

Continued on next page

For more information circle No. 33 on the Reader Service Card

DIE CASTING DIES



Complete Engineering and Tool Room Facilities for designing and building Plastic Molds and Die Casting Dies.

Damen adheres to the highest standards of workmanship and mechanical skills for the building of quality Molds and Dies.

We build Hobs and can furnish Hobbed Cavities in beryllium copper and air, oil or water hardening Hobbing Steel. Sizes up to 9" x 14" x 7" deep.

Modern Duplicating Equipment for Duplicating Models or Plaster Castings. We can machine mold bases up to 24" x 36".

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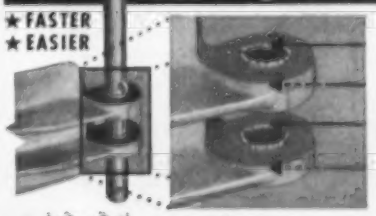
HOW TO.... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION with the amazing NOBUR TOOL

★ FASTER
★ EASIER



No more hand finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by **machine operation.** Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.

1 Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter blade against the workpiece quickly deburrs the outside surface.

2 After outside surface is deburred, slide knurled sleeve back to fully retract the cutter-blade below pilot body diameter.

3 With cutter-blade retracted move workpiece or tool to position for deburring inside surface. Raise cutter-blade to deburr first one surface then the other.

Write for FREE Folder
Send for all details on Nobur Tool Products TODAY!

NO/BUR TOOLS
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TAP up to
8 HOLES
at a
TIME
IN ANY PATTERN
with a MULTI-TAPPER
★ AUTOMATIC TAP REVERSAL
★ FITS ANY DRILL PRESS
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MULTI-TAPPER simultaneously handles different tap sizes and pitches—can be set up for automatic or semi-automatic operation. Makes any drill press a production tapping tool.
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USEFUL LITERATURE—Continued

Standard Carbide Blanks: **184**
Besly-Welles Corp., 12 pages, Catalog No. 851C. A wide range of carbide blanks for cutting needs is listed in the catalog. Prices, sizes, styles, and shapes of the blanks are also given.

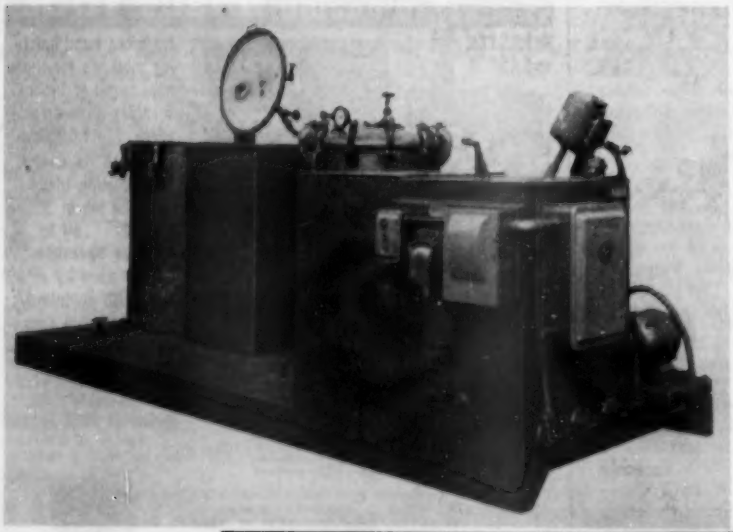
Nickel Plating Procedures: **185**
Hanson-Van Winkle-Munning Co., 20-page technical manual. This manual describes the preparation, operation, maintenance and equipment requirements for the company's processes for producing bright nickel electrodeposits. Tabular data and engineering information are also included as well as a discussion of plating procedures and analytical solutions.

Safety Cleaning Solvent: **186**
Turco Products, Inc., 4-page, 3-color folder. Designed for the in-place cleaning of electrical equipment, a detergent-action safety solvent has been found suitable for wiping of small parts. The folder contains charts which cover toxicity, flash point throughout evaporation cycle, and evaporation rate of the new solvent as well as other commonly used cleaning solvents.

Nickel Undercoating for Rhodium: **223**
Sel-Rex Precious Metals, Inc., 10 pages, technical paper. The paper describes the company's new compressively stressed nickel plating process. Developed specifically as an undercoating to counteract rhodium electroplate's inherent high stress characteristics, the process utilizes only one addition agent but all other operating conditions are the same as conventional nickel plating.

"Designed for Die Castings—Accepted by Die Casters"

TINCHER PROCESS high vacuum pressure impregnation units for recovery of porous castings will transform porous parts in your scrap heap to perfect parts on your customers' production lines. Send for data on complete range of units.



AVAILABLE FOR METALLIC OR PLASTIC SEALANTS IN ALL SIZES.

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Dimensions	4' wide, 12' long
Heated By	Gas, steam or electricity
Cost	$3500 to $4100
Delivery	Some units from stock, others 2 to 4 weeks
F.O.B.	Milwaukee
Casting Sealants? Of course!	

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Motorized Indexing Heads: **187**
Multiplex Co., 3-page illustrated pamphlet. Literature has been released on a motor-driven rotary head designed also for manual indexing. The head is equipped with collets ranging from ¼" to 1", with an interchangeable 4" three-jaw chuck.

Electro-Spray Painting: **224**
Ransburg Electro-Coating Corp., 15-page, 2-color illustrated booklet. Complete details of the company's No. 2 electrostatic spray painting process are presented in text, photographs, and diagrams. Typical on-the-line examples of the process in action are shown and the entire scope of the process as to type of article, type of coating, production rate, etc. is revealed.

Machining of Castings: **225**
Meehanite Metal Corp., 20 pages, Bulletin No. 29. This booklet, "How to Machine Meehanite Castings," contains general machining data of interest to designers, engineers, and users of the company's castings.

Finger Buff for Castings: **226**
Geo. R. Churchill Co., Inc., Descriptive catalog. Developed specifically for buffing die castings, a new finger buff is made with a double row of overlapped and staggered fingers in each section.

Industrial Carbide Products: **227**
Carmet Div., Allegheny Ludlum Steel Corp., 32 pages, 2-color engineering manual. Detailed information, charts, and other data on carbide applications and available tools with carbide tips, are given in this booklet. There is a section on carbide grade selection.

Barrel Finishing Methods: **195**
Oakite Products, Inc., 4-page, technical folder. A folder describing the company's barrel finishing methods and materials has recently been published.

Can your tapper pass this Performance Test?

(CHECK IF "YES" ONLY)

- ☐ Maintains production for long periods
- ☐ Less operator fatigue
- ☐ Fewer Broken taps
- ☐ Less "down time" interruption
- ☐ Fewer spoiled pieces
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If You Cannot Answer Yes to Each of the Above . . . Your Tapper is Not Operating Efficiently

There Is a difference in tapping heads and in Procunier you'll find that unmistakable difference. If your tapper is not producing up to par—regardless of your demands and schedules—it will pay you to check into the possibility of using Procunier. They have been consistently producing "profitably" under "back breaking" production schedules everywhere!

Procunier superiority can be attributed to many unique construction features: practical double cone cork faced friction clutch, wobble free spindle, quick start, stop and reverse mechanism, finger tip control, exclusive tap holder, plus others. Get the full story today.

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CENTRIFUGAL CASTING NOW IDEAL FOR CLOSE-TOLERANCE, HIGH-PRODUCTION WORK

By F. S. Ross, Vice-President in charge of Engineering Centr-O-Cast and Engineering Co.

Up to a few years ago, the centrifugal casting process was employed primarily to manufacture such items as bronze bushings and cast iron soil pipe . . . items that were either machined in their entirety or destined for applications where finish and accuracy were not important. However, centrifugal casting techniques began to improve with the experience gained casting bronze for armaments and railroad equipment. More accurate castings became possible, and faster production machinery developed.

The inherent good qualities of centrifugal castings had long been recognized: denser structure, more homogeneous mass, higher yield. For high-quality, low-production parts, the process was ideal, and it was felt that this type of casting would eventually dominate in any application where consistent quality was a prerequisite. The only drawback had been high production cost. Now, as older, slower foundry methods were replaced by efficient techniques and equipment, that drawback was removed.

Over the years, through re-design and improvement of centrifugal machinery, we at Centr-O-Cast have mechanized the centrifugal process to the point where we are selling at a cost comparable to die casting, with all the excellent properties of a permanent mold casting. No longer is the centrifugal process a backward method; its close tolerances, coring of holes, and interchangeability are now widely accepted by engineers.

On one particular part which we recently produced, the dimensional accuracy of the centrifugal casting was such that the parts were interchangeable with die castings. The die costs in the centrifugal method were one-third those of the die casting, and the resulting product was superior.

We can now say that our product has the accuracy of a die casting combined with the good physicals of a permanent mold casting. Because aluminum is so well suited to centrifugal and permanent mold casting, we are able to produce light, low-cost, easily machined parts for appliances, or for the aircraft and automotive industries, where light weight is increasingly important.

centr-O-cast
AND ENGINEERING COMPANY
45 St. Jean Avenue • Detroit, Michigan

54

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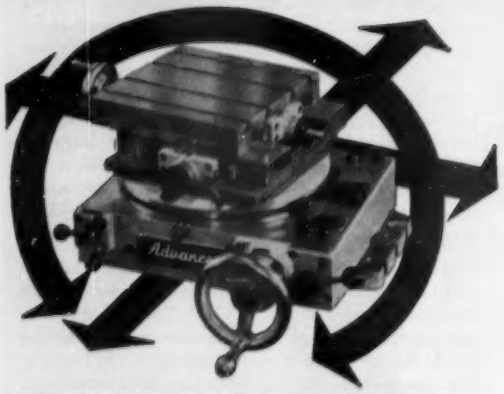
Cut MOLD-MAKING Costs

30 SECONDS ACCURACY

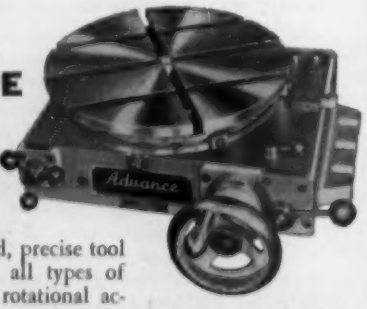


ADVANCE CROSS-SLIDE ROTARY TABLE

Permits fast precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work.

ADVANCE 15" ROTARY TABLE



This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision and minimum maintenance fills the need for a precision unit at a moderate price.

The best quality of materials and workmanship, combined with high accuracy, provide the user with a top quality precision tool.

Full Details on Request

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943 W. LAKE STREET, DEPT. C1, CHICAGO 7, ILLINOIS

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PEAK YEARS . . . still ahead

continued from page 52

trols and chain saws. Writes a producer of industrial internal combustion engines. "Using die cast cylinder heads as we do, we find ourselves limited when machining for higher compression ratios by under surface porosity."

Finishing improvements were the subject of a large number of comments. Writes a manufacturer of motion picture equipment, "Better bonding with paint finishes for outdoors." A sporting goods maker calls for "a satisfactory and consistent electroplating process." A producer of automotive hardware asks for "Ability to color anodize aluminum castings."

Other factors mentioned as needing improvement are: alloys approaching steel in characteristics; low cost copper alloy castings; general reduction in wall thicknesses; improved stress and corrosive properties; further alloys of zinc and aluminum with increased physicals; interchangeable dies to cut the cost of small runs.

Comments a manufacturer of TV receivers, "Desirable to have better shrinkage factor on zinc castings, control flashing and trimming in accordance with injection molded parts."

A producer of gas safety valves asks for "improved porosity conditions. Very important in pressure (type) tight castings. Mfrs. of gas controls and other types of castings where pressure is paramount cannot always design having equal cross sections which, as of now, seems almost mandatory. Porosity also affects casting strength, especially at threaded sections. Less porosity would definitely lead to more extensive use."

THIS WATER SOLUBLE CUTTING COOLANT STAYS MIXED

FISKE "MAGIC" COMPOUND, when dissolved in water, goes into a permanent emulsion . . . will never separate. It cools, lubricates and produces a high finish. Lengthens tool life. There's nothing so good for milling, drilling, grinding, turning, sawing, threading, wire drawing and stamping. Does not become rancid. Try Fiske "MAGIC" Compound and see the improvement in your work.

Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

FISKE BROTHERS REFINING CO.

Newark 5, N. J. and Toledo 5, Ohio

METAL WORKING LUBRICANTS

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USERS' VIEWS

continued from page 54

PAUL HUBER, Chief Engineer
Weston Electric Instrument Co.

". . . I believe that our use of die castings in the next year will probably increase, . . . mostly zinc though we use some aluminum castings. Our choice of zinc is based on the problems of scrap: where we have difficult parts to mold we can usually make them in zinc, but not in aluminum.

". . . while we do much of the final machining and surface finishing ourselves, a good deal of controversy could be avoided if the vendor were equipped to furnish a completely finished product. Particularly on castings with fairly large flat surfaces, we find there is considerable problem in getting our casting supplier and our finishing department to agree on whose fault it is when the finish does not come out right."

". . . there seems to be a general trend toward the centralization of all operations. Several years ago the vendor didn't want any part of either surface finishing or machining. Their job was to get out castings, the more the better, and that was all. Today the vendor seems more inclined to hand the customer a finished piece so that responsibility is kept in one place."

B. A. DALEY, Chief Engineer
Servel Corp.

". . . we will definitely continue to use both zinc and aluminum die castings. The quantities will, of course, depend upon general business conditions. For our purposes the choice of die castings is based upon three things: cost, finish and corrosion resistance, in about that order."

". . . the greatest improvement that the die caster could make, as far as our castings is concerned, is in the matter of gas tightness. Many of our applications require gas tight castings and this is, and always has been, one of our problems. Along the same line, soundness of large castings, as it affects surface finish, is also a problem. In our ice maker, for example, surface imperfections cause a great deal of trouble. This does not reflect adversely on our suppliers, they have and do bend over backwards to give us the quality of castings we want at the time we want them."

". . . but don't misunderstand me on the question of porosity. While it has always been a problem, it is one that we can live with. The vendors have done an excellent job in reducing the number of unuseable castings and are constantly improving."

W. J. DELAHANTY, Vice President, Mfg.
The Burroughs Corp.

". . . our use of die castings next year will be about the same, both as to amount and material as during the past year. Primarily, our castings are for cases, bases and carriage parts where appearance is highly important. Many of these parts were made by deep drawing, but with die castings we get a better part."

". . . we would like to see somewhat better quality castings, particularly for those parts where porosity presents a problem. Nevertheless, our use of die casting is increasing and will continue to increase. We have many places that might require 20 to 25 different machining operations — we throw in a die casting and get more strength at a lower cost."

". . . at present we do all of our own finishing, this applies to both machining and surface finishing. I believe that we would prefer to do it this way rather than have our vendors do the work for us."

WHERE COST is a PRIME CONSIDERATION . . . Investigate INVESTMENT CASTING

This part, of 18-8 Stainless is used for Aircraft Electrical Harness Assemblies. Formerly made as two separate pieces and brazed—it is now cast in one piece.

Here is the highly efficient way to produce accurate castings with close tolerances. If material and labor costs have you concerned, a careful analysis of your multiple machining operations will point up Investment Casting as your best bet to SAVE UP TO 61% ON LABOR, TOOLING, MACHINING AND ASSEMBLY TIME.

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QUALITY CONTROL—We guarantee our work by virtue of complete inspection facilities: X-Ray, Zyglo, Heat Treating Facilities, Etc.

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INVESTMENT CASTING CO.

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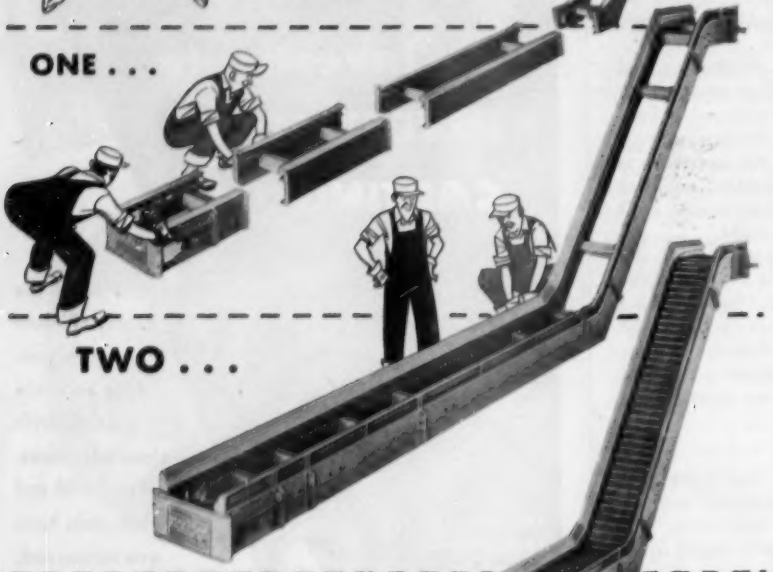

TWO . . .

THREE . . .

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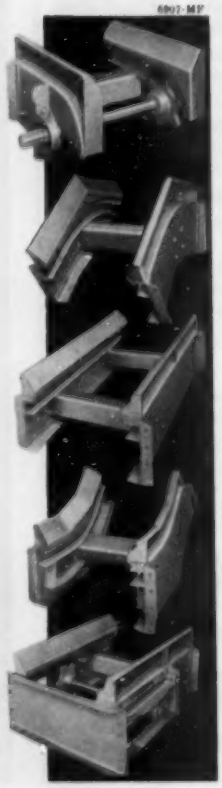


For more information circle No. 70 on the Reader Service Card

METAL SHOW ATTENDANCE EXPECTED TO HIT 46,000

The 1956 edition of the National Metal Exposition and Congress—"the Metal Show"—to be held in Cleveland from October 8-12, will be the largest in the 38 year history of the show.

Wm. H. Eisenman, general manager, and national secretary of the American Society for Metals, sponsor of the gigantic industrial assembly, reports an exhibitor roster of 465 companies whose displays will fill every one of the 250,000 square feet available in the city's huge Public Auditorium and Exhibition Halls.

Cleveland is one of three cities whose facilities provide adequately for the Show, theme of which for this year is "spend-to-save".

"Strong emphasis on the cost-cutting economies of new equipment will be stressed more than ever this year. Greater efficiency in operation means only one thing—greater production savings," observes W. H. Eisenman.

Registrations at the recent 1955 Metal Show in Philadelphia totalled 39,701 individuals of which 4,931 were top management officials, 10,576 key production heads, 8,192 top engineers and 5,269 metallurgists having policy responsibilities.

Advance estimates indicate attendance at the upcoming Cleveland Show will be close to 46,000. Registration falls into three classes—members of the American Society for Metals and of associated societies, guests invited by exhibitors, and the general industrial public.

All sessions of the National Metal Congress with its program of more than 150 technical papers will be held in four hotels of the city, each a headquarters for one of the four technical societies participating.

Hours of the show on the first three days will be from 12:00 noon to 10:30 P.M. and on the last two days from 10:00 A.M. to 6:00 P.M.

FRED ALLON JOINS WAIMET

H. P. Gibbons has resigned as superintendent of WaiMet Alloys Co., Detroit, to teach metallurgy at the University of Colorado. His successor is Fred R. H. Allon, former superintendent, stainless steel division, Shawnigan Chemicals, Ltd. Mr. Gibbons will continue as a consultant for WaiMet.

ANODIZED IN BRIGHT COLORS, these two aluminum die castings are among the early samples produced by Webarm and finished by Aluminum Anodizers, Inc. Note: the color of this illustration is not representative of the actual colors obtained.

Here is a fully detailed report on a brand new aluminum alloy that is claimed to make possible the . . .

Color Anodizing of Die Castings

THE difficulty in finding an aluminum alloy that can be color anodized successfully, and that is also die castable, has long plagued the die casting industry. Many potential applications for aluminum die castings await the development of such an alloy.

The presence of silicon in the aluminum alloy to gain proper fluidity, has prevented successful color anodizing. Some of the metal producers and leading die casters have devoted time and money to developing an aluminum alloy without silicon that can be die cast and color anodized. So far, none has reported success, although some claim to be on the verge of perfecting such an alloy.

When a letter from a British die caster was published in Precision Metal Molding in January 1956, reporting the development of such an alloy, a flood of letters was received seeking further information. Among them was a letter from a New England die caster who claimed to have such an alloy, and to be producing die castings in it that were color anodized.

Whether or not this alloy is the one that the die casting industry (and its customers) have sought, remains to be demonstrated on a production basis. However, here are the details concerning this new material: its composition (which has been patented), its physical properties as tested at three laboratories, and its performance characteristics.

According to John Weber, of the Webarm Die Casting Co., who developed the new alloy; it is castable by any of the well known foundry methods; i.e. die casting, permanent mold casting, investment casting, plaster mold casting, shell mold casting and green sand casting. Experimental work done thus far indicates that castings made from this alloy will anodize as easily and give as good a finish and color as wrought aluminum.

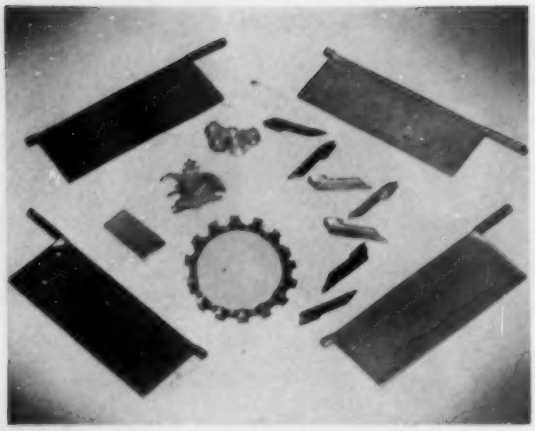
Except for anodizing which was done on casting made by three different methods, most of the test results reported in Table 1 were made on sand cast specimens. Most of the results are from tests performed at Wright Field, Purdue University and the University of Chicago. Testing done at Wright Field is reported in Test No. EMG-M-56-4289.

For purposes of comparison, the properties of alloys no. 13, 43 and 380 (when available) are given in Table 1 along with the properties of the new alloy which will be designated as Alloy W for this report.

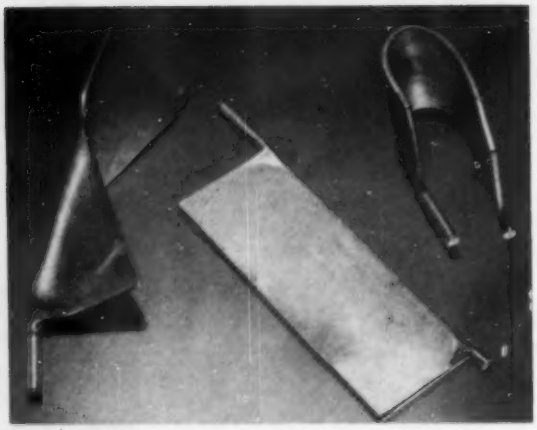
DIE CASTABILITY: The alloy is reported to be about as easy to die cast as alloy 380, easier to cast than alloy 218 and harder to cast than alloy 13. Die lubrication is somewhat of a problem; to date, the most satisfactory die lubricant is Die Slick 211. Silicone base die lubricants are reported to be not satisfactory.

Using a Cleveland 400N die casting machine, the cycle for casting is the same for this alloy as for any other aluminum alloy in making the same part in the same die and on the same machine. This refers to speed of cycling, ejection, locking pressures and injection speed and pressures. In general it has been found that the ejector half of the die should be run slightly warmer than the cover half.

POROSITY: Pin point porosity is apparently completely eliminated in this alloy in so far as buffing, polishing and anodizing results are concerned. With most die cast alloys this porosity causes streaking and discoloration in anodizing; this is absent in die castings made from the new alloy.



COLORS OBTAINED on these aluminum castings include red, blue, green, yellow and silver. Large pieces are die castings. Others include one plaster mold casting and one sand casting.



HIGH DUCTILITY is another important property claimed for the new alloy. Two samples at left and right were bent in a vise to demonstrate this unusual mechanical property.

TABLE 1. How Alloy W Compares

COMPOSITION:

	Alloy W	13	43	380
Copper	0.57 - 0.90	——	——	3.5
Nickel	0.28 - 0.36	——	——	——
Magnesium	0.14 - 0.17	——	——	——
Cobalt	0.23 - 0.28	——	——	——
Vanadium	0.0005	——	——	——
Silver	0.05	——	——	——
Chromium	0.001	——	——	——
Tungsten	0.0005	——	——	——
Beryllium	0.0005	——	——	——
Silicon	——	12.0	5.0	9.0
Impurities (total)	0.07 max.	*	*	*
Aluminum	Bal.	*	*	*

*Aluminum plus normal impurities constitutes the balance.

PHYSICAL AND MECHANICAL PROPERTIES (alloy W as sand cast and heat treated, others as die cast)

Ult. Tensile Str., psi	39,700	39,000	30,000	46,000
Yield Str., psi	34,300	21,000	16,000	26,000
Elong. in 2" %	4.0	2.0	9.0	2.0
Hardness Rock. E	89	——	——	——
Ult. Tensile Str., psi at				
200 F	35,000	34,000	26,000	43,000
300 F	26,200	30,000	23,000	37,000
400 F	22,600	25,000	19,000	28,000
500 F	19,000	19,000	14,000	15,000
600 F	12,900	——	——	——
700 F	8,350	——	——	——
Elong. % in 2" at				
500 F	——	20	23	10
700 F	24.5	——	——	——
Young's Mod., psi	13,000,000	10,300,000	10,300,000	10,300,000
Spec. Grav. g/cc	2.72	2.65	2.65	2.72
Elec. Cond. in % of annealed copper	52-54	31	27	23
Thermal Cond. BTU/ft²/in/deg F/sec.	0.42	0.23	0.27	0.19
Thermal Exp. in/in/deg F x 10⁻⁶				
68 F to 212 F	10.1	11.4	12.2	11.6
68 F to 392 F	12.3	11.9	12.7	12.1
68 F to 572 F	13.5	12.5	13.3	12.5

ANODIZED ALUMINUM—continued

AGE HARDENING: The alloy is age hardenable. Recommended practice is to quench on removal from the die or mold and then age at 420F for 8 hours. Room temperature aging will occur with maximum strength and hardness achieved in 90 days. No dimensional changes have been observed during age hardening. Change in hardness due to aging is:

As cast	60 Rockwell E
As aged	90 Rockwell E

POLISHING: Buffing and polishing are somewhat easier for this alloy than for other aluminum die castings. The polished surface is said to retain its high lustre over a period of years without apparent change. As noted, discoloring oxides are completely absent.

DUCTILITY: This material seems to have high ductility. Bend and twist tests, shown on die cast panels are approximately 2¾" x 7½" x 0.065 thick. A bead hemispherical in cross section about ⅛" x ⅛" was cast around three sides of the panel. These panels were bent through 180 degrees around a radius of approximately ⅞". In torsion the test panels could be twisted through at least 90 degrees without failure.

ANODIZABILITY: According to the company which has done all of the anodizing thus far (Aluminum Anodizers, Inc.) the cast alloy responds to anodizing as easily

and gives as good an anodized and colored finish as wrought stock. Die castings, sand castings and plaster mold castings have been anodized and colored successfully. All anodizing was done according to specification MIL-A-8625a.

In all but one case the parts were anodized in the as-cast condition, one die casting, the small rosette, was given a bright dip prior to casting. The smut that is characteristic of die cast alloys with silicon when anodized, is entirely absent with this alloy. A small amount of smut generally appears in the first cleaning step, but is removed in subsequent cleaning and rinsing. It is believed that much of this first smut comes from pick-up from a die that had previously been used for high silicon alloy aluminum die casting.

Die castings have been colored with all available dyes, red, blue, rose, green, gold, and black among others.

COSTS: Up to the present time this alloy has not been made in large tonnage lots. In small quantities the cost is about 30 percent higher than other aluminum die casting alloys.

EFFECT OF BORON AND TITANIUM ON ALLOYS

The influence of boron, alone or with titanium, on the high-temperature strength of a 13 Cr-15 Ni-2 Mo-0.6 W-0.6 Ti alloy is discussed in a study for the Air Force just released to industry through the Office of Technical Services, U. S. Department of Commerce.

It was found in the research that boron markedly increases creep-rupture strength by an alloying effect involving either solid solution strengthening or, more probably, a strain-aging type reaction under the slow strain rates and small deformations of creep-rupture conditions.

This report, PB 121101 *Investigation of the Influence of Boron and Titanium on the High-Temperature Properties of Cr-Ni-Mo-Fe Austenitic Alloys*, C. L. Corey and J. W. Freeman, University of Michigan, for Wright Air Development Center, Dec. 1954, may be ordered from OTS, U. S. Department of Commerce, Washington 25. It contains 72 pages, price $2.

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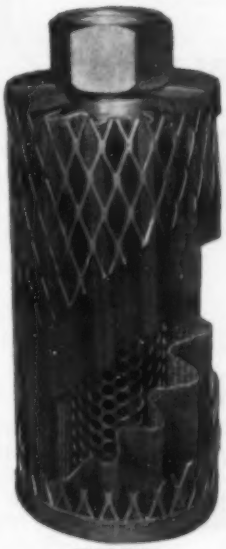
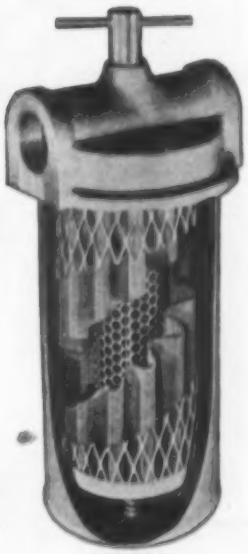


SUMP TYPE (cutaway)

Meet J.I.C. Standards

OVER 700 Original Equipment Manufacturers now install MARVEL SYNCLINAL FILTERS as Standard Equipment



LINE TYPE (cutaway)

Hydraulic Oils MUST BE CLEAN to Protect Equipment — Increase Production — Reduce Maintenance

PRODUCTION ENGINEERS and MAINTENANCE MEN, whose job it is to keep production machinery operating at peak efficiency, are specifying Marvel Synclinal Filters on new equipment and standardizing with Marvels throughout their plants.

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The Synclinal design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage capacity for filtered out particles. Thus, longer periods of productive operation are attained before filter cleaning is necessary. Marvel Synclinal Filters are easy to clean because both the sump and line type may be disassembled, thoroughly cleaned and reassembled in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

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As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

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Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

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Without obligation, please send me complete data on Marvel Synclinal Filters, as follows:—

- ☐ Catalog 5107—For Hydraulic Oils, Coolants, Lubricants
- ☐ Catalog 5206—For Fire-resistant Hydraulic Fluids (Aqueous Base)
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IN SHAPE

The picture tells the story . . . from the cross section it can be seen that the inside dimensions are greater than the holes. How else but by Investment Casting could this be made in one piece?

IN DETAIL REPRODUCTION

One look quickly shows the machining problems — most of them stock removal. By using an Investment Casting 21 out of 45 machining operations were eliminated.

IN MATERIAL

These nozzles for a highway striping paint sprayer, were produced from cold rolled steel until ground glass was introduced into the paint for its reflective properties. To provide necessary wear resistance these parts are now cast in a non-machinable alloy. Performance was not sacrificed because of material limitations.

These are a few examples demonstrating that the function of the part is the first consideration in design — and — the Investment Casting process was the economical answer.

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FORM RESEARCH GROUP FOR INDUSTRIAL WORK

The formation of Tyron, Inc. has been announced by the company's president, Dr. Harold S. Mickley. Tyron was organized to undertake industrial research, development, and manufacture on its own account or on a contract basis in the fields of mechanical and chemical processes, including heat transfer, combustion, fluid mechanics, corrosion, and materials of construction.

The staff is also familiar with such problems as the development of special power plants, the cooling of electronic equipment, the cooling of high-speed vehicles, the cooling and lubrication of high-speed power plants, the "potting" of electronic components for thermal, moisture and shock protection as well as the design and development of special fluid flow devices such as flow meters, ejectors, thrust augmentors, pumps and compressors.

Dr. Mickley, who received his undergraduate training at California Institute of Technology, continued his graduate study at Massachusetts Institute of Technology where he has been an associate professor of chemical engineering since 1948. He is a director of Nuclear Development Corporation of America.

Ernest P. Neumann is executive vice president of the company. After receiving his B. S. in mechanical engineering from Massachusetts Institute of Technology in 1938, Neumann continued his graduate studies and became associate director of M.I.T.'s Gas Turbine Laboratory.

VALENITE EXPANDS

Valenite Metals Corp., Madison Heights, Mich., will expand plant facilities to triple its present size this summer, according to El Kotwick, president of the organization.

While Valenite's tungsten carbide tips and tools have only been in production for a year and a half, the plant must be expanded to keep ahead of orders, Kotwick said.

Footings have already been poured on the Madison Heights site and construction is expected to be completed by fall without any disruption of the present processing setup.

METALS

continued from page 58

"In aluminum, automotive use will exceed 1956 by some 24 million pounds and other uses should increase 16 million pounds . . . a gross increase of 40 million pounds above the 1955 high and a total production of 372 million pounds of aluminum die castings. With aluminum need for alloying likely to reach 34 million pounds, 1957 should see die casting use exceed 400 million pounds."

Many factors can enter the picture to alter early estimates, but it is unlikely that any major technical developments, such as the introduction of anodizable aluminum alloy, the production of die cast engine blocks, or other special new application, can affect 1957 figures. The amount of engineering and development time needed, even after such innovations pass the laboratory stage, would preclude any large-scale introduction of new alloys, new components or new designs in current models. Tooling for 1957 cars, for example, is so far along that no fundamental changes in design or material can be undertaken without heavy loss in money already spent for tools and dies.

If the industry's practice of making major design changes only in alternate years holds true, then it would mean that new technical developments calling for basic redesign could have no serious impact before the 1959 models are introduced late in 1958.

As one aluminum smelter points out, the auto industry is not likely to introduce any important change that will call for a big allocation of metal until they have assured themselves that the metal is available.

Here are some opinions of producers and alloyers of metals used in the die casting industry:

Leading producers and alloyers of die casting metals agree that tonnages of both zinc and aluminum alloy used by the industry in 1957 will equal or slightly surpass 1955, that imports of both metals will increase, that prices should hold steady although the recent steel wage settlement is expected to have upward influence in the non-ferrous field and may result in some price rises.

Producers of primary aluminum in Canada are expected to ship more metal into the United States, with perhaps the greatest amount going into the Mid-west. If zinc die casting sales continue high, increases are also expected in the shipment of zinc alloy into the United States. Some of this metal is now coming in under barter agreement in which the U.S. is shipping out grain, but all of the metal so-imported is going into government stockpiles and is unlikely to affect market prices.

SONKEN-GALAMBA EXPANDS FLORIDA FACILITIES

Plans for expansion of the company's existing branch facilities at Miami, Fla., have been announced by Donald J. Galamba, vice president of Sonken-Galamba Corp., producers of smelters aluminum alloy ingot and other smelter products.

Completion of the Florida facilities' expansion is set for the first of the year, doubling the company's existing Southern capacity and materially increasing the over-all production potential of the company. Home plant is in Kansas City, Kans., with a branch in Miami and sales offices and warehouses in Los Angeles, Chicago, Minneapolis, New York, St. Louis and Houston.

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HOEGANAES *offers* STAINLESS POWDERS

and a variety of POWDERED ALLOYS

for structural parts and filter production

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Powder Metallurgists have long awaited high quality stainless and special alloy powders *that would give top production performance.*

Now, Hoeganaes makes that kind of parts production possible—with stainless grades AISI type No. 302 B and No. 316. In addition, Hoeganaes offers a variety of alloys in powder form.

Consider these facts. Two mesh sizes are standard; −40 +100 mesh for filters and −100 mesh for structural parts. Controlled particle shape from spherical to irregular. Even powder quality. Low oxygen content. Completely prealloyed powders. And high physicals.

There are more facts . . . why not review them with your Hoeganaes Sales Engineer. Ask for his services today.

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The Use of Zinc for Die-

...Over the years, is taking the shape of an Accelerated Curve, pulled ever upward by the Sheer Weight of Values that only Zinc can provide.

At the close of 1955, current figures showed a remarkable increase in the use of die-castings. Taking in all five non-ferrous metals, the record shows that in 1955 DIE-CASTINGS totaled in weight:

1,164,200,000 pounds

and of this ZINC DIE-CASTINGS accounted for

784,000,000 pounds

Zinc offers several outstanding values to the producers of die-cast component parts or finished articles!

- ★ **The low melting point of the zinc base alloy makes it possible to produce castings at a speed not attainable with alloys based on other competitive metals.**
- ★ **The lower casting temperature reduces costs of fuel, dies, and die maintenance.**
- ★ **High degree of fluidity at casting temperature permits the casting of very intricate designs requiring little or no subsequent machining.**
- ★ **Zinc Die-Castings assure dimensional accuracy.**
- ★ **Zinc Die-Castings come from the machine with a remarkably smooth surface which seldom requires more than a buffing touch (if that) prior to plating or other forms of surface finishing.**

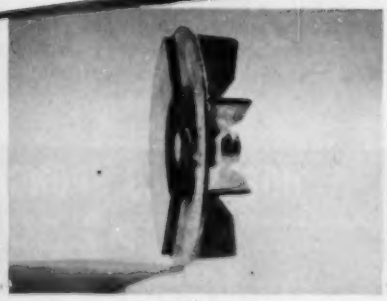
Above are five good reasons why Zinc should be your choice for the die-cast metal base.

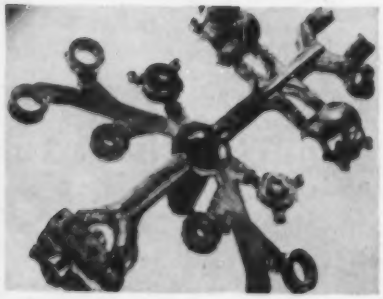
Why BUNKER HILL? Because it is the first and foremost 99.99+ zinc . . . a zinc that will assure the finest die-castings that can be made.

Die-Casting...the Process

ZINC...the Metal

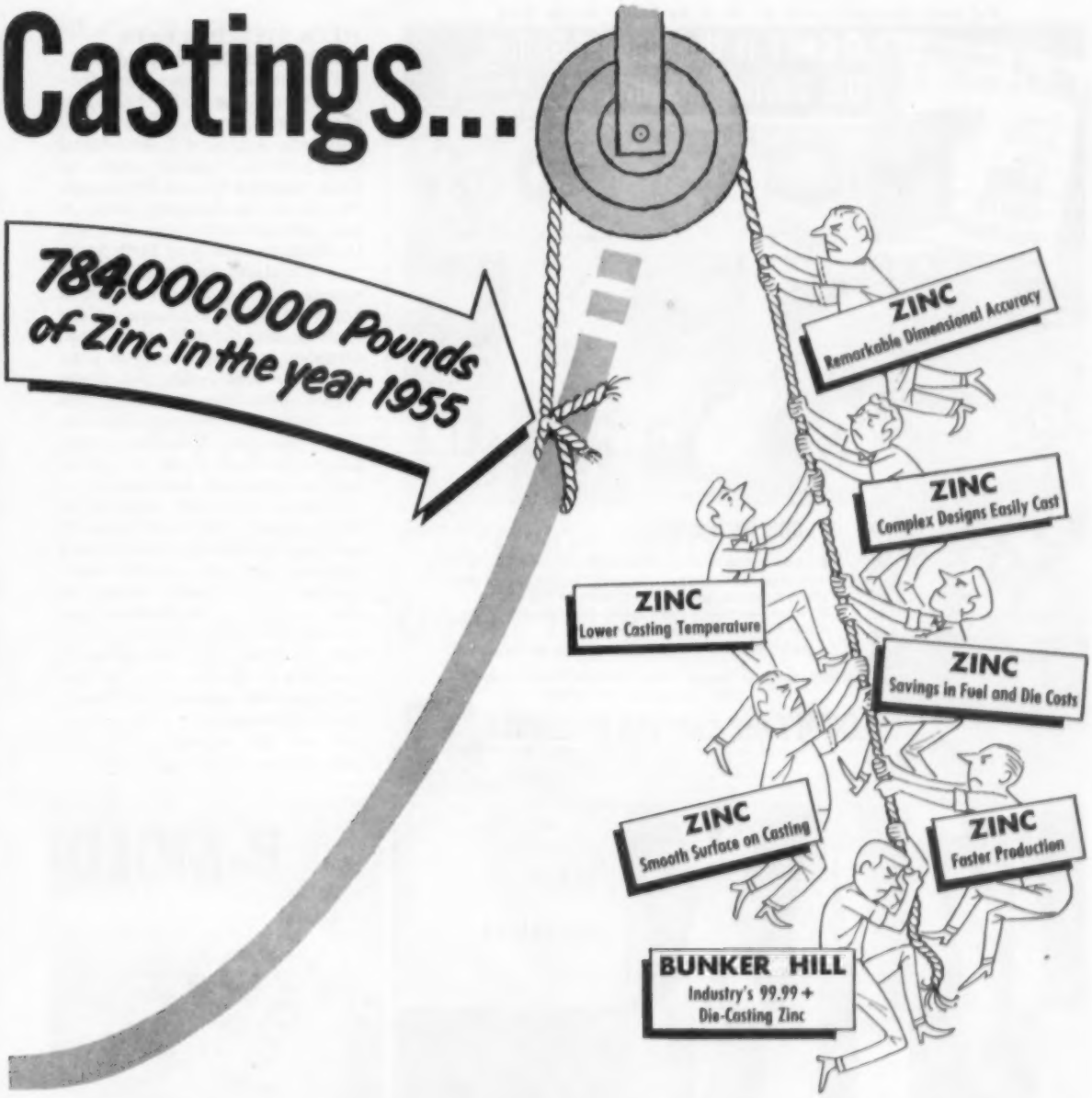
BUNKER HILL...the ZINC





Castings...

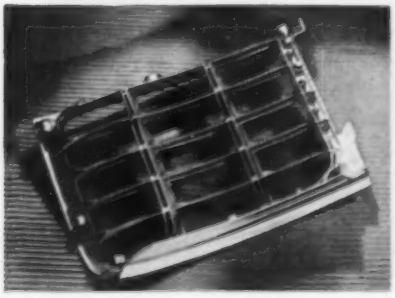
784,000,000 Pounds of Zinc in the year 1955



EASTERN SALES AGENTS **ST. JOSEPH LEAD COMPANY** 250 PARK AVENUE, NEW YORK 17

BUNKER HILL 99.99+% ZINC

SALES OFFICE FOR PACIFIC COAST **NORTHWEST LEAD COMPANY** SEATTLE, WASHINGTON



For more information circle No. 22 on the Reader Service Card

New! Rapid Fire Model
Free Cycles OVER 3,000 SHOTS PER HOUR!

DCMT is the Biggest-Selling Die Casting Machine in these Industries

WATCH CASES
TOY GUNS
SEWING MACHINES
MECHANICAL PENCILS
RAZORS
CUTLERY
LOCKS
MOTORS
SMOKING ACCESSORIES
FURNITURE HARDWARE
DRAPERY HARDWARE
EYE GLASSES
CANDELABRA
BUILDER'S HARDWARE
ARMAMENT
BUCKLES
TOY AIRCRAFT
ELECTRICAL CONNECTORS
LIGHTING FIXTURES
NAME PLATES

. . . and here's why!

- Extreme casting speed permits lowest cost, single cavity molds
- Highest grade, milky-white "hardware" finish • Special DCMT prefab die blocks mean fast die delivery, tooling economies
- 2-3 minutes to change dies • Lowest operating cost, lowest maintenance, least floor space .

. . . and it's the safest, lowest-priced machine on the market!

Write today for 24-page book, explaining entire process and DCMT packaged die-casting shop

DCMT DIE CASTING MACHINES
Division of British Industries Corp., Dept DM-366
Port Washington, New York

DIE CASTING SMALL PARTS

FIRTH STERLING BUYS SCHWARZKOPF FACILITIES

The Yonkers research and laboratory facilities of the Schwarzkopf Development Corporation (formerly American Electro Metal Corp.) have been acquired by Firth Sterling Inc. of Pittsburgh, Pa., at an undisclosed price, it has been announced by Kenneth D. Mann, president of Firth Sterling and Harry L. Osterweis, executive vice president of Schwarzkopf. At the same time a license agreement in the field of cemented tungsten carbides has been concluded between the two companies. The two companies are also jointly interested in Borolite Corporation of Pittsburgh, a manufacturer of products for ultra-high-temperature applications.

"It is our intention" Kenneth D. Mann stated, "not only to maintain the Yonkers organization and facilities, but to expand them gradually. Among other things, we plan to continue in Yonkers the various important research projects in which that laboratory is presently engaged for various governmental agencies." Schwarzkopf Development Corporation, will continue certain of its research projects in other fields.

MAX . . PURITY
. . UNIFORMITY

MIN . . DELIVERY TIME
. . PRODUCTION PROBLEMS

ZINC-BASE ALLOYS

AMCO can furnish the precise alloy you specify . . . when you need delivery.

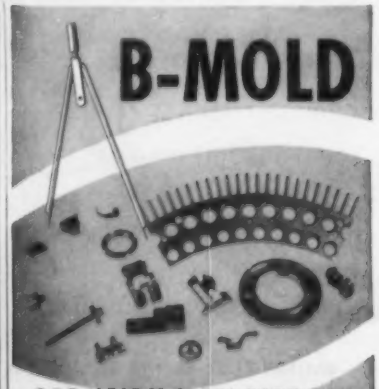
Backed by years of service to die casters and a proven record of quality, AMCO provides a *reliable* source of premium quality zinc-base alloys that permits you to make and maintain trouble-free production schedules.

For further information on AMCO zinc-base alloys, please contact:

THE AMERICAN METAL COMPANY, LTD.
61 BROADWAY, NEW YORK 6, NEW YORK

For more information circle No. 13 on the Reader Service Card

B-MOLD



PRECISION NON-FERROUS PERMANENT MOLD
CASTINGS

Aluminum Bronzes, Manganese Bronzes, Yellow Brasses, Beryllium Copper and Aluminum Alloys

Consult our Engineering Department, without obligation.

B-MOLD DIVISION
Buckeye Brass & Mfg. Co.
671 N. Main St. • Mansfield, O.

Circle No. 20 on the Reader Service Card

HEAT CONTROL

continued from page 80

which have to be maintained in close contact to obtain satisfactory sealage against escape of water or steam during use. The high temperatures at which dies have to be worked, and the heat fluctuations commonly occurring, are inimical to the preseveration of leak-proof joints, owing to unequalized shrinkage or expansion between the several parts of the bush and the die-block etc. Thus where there is a multiplicity of jointing surfaces the risks of leakage from the above causes are correspondingly increased.

It is true of course, that if the water is maintained in regular circulation with such a two-piece sprue bush, the temperature differential between its component parts and with the surrounding region of the die, can be kept relatively small. In practical working it is unfortunately true that such conditions cannot always be maintained. Common exigencies frequently necessitate the shutting-down of the die and stoppage of its water supply, in order to overcome one or other of the numerous minor problems which commonly arise.

This means, that when the die is re-started after such an interruption, it may have to flow through an overheated bush channel. The sudden cooling and excessive contraction resulting from such condition often leads to the cracking of the inner sleeve member. Usually such crack will be disposed axially in line with the tapered channel in the bore of the member. The liability towards such cracking and damage will normally be more prevalent with a two-piece bushing than a single-piece type, owing to the necessarily much thinner wall sections in the former.

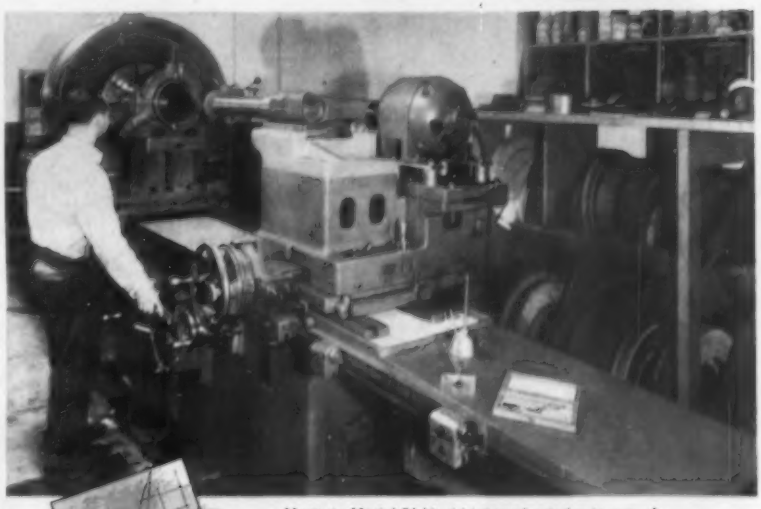
Risks of this nature cannot be wholly eliminated whatever design of sprue bush is employed. But experience reveals they can be considerably minimized by employing a single-piece *cast* sprue bushing, wherein the water chamber is *cored* in position when moulding the part. This modern form of bushing has fewer critical jointing surfaces upon which a close water seal has to be maintained, and wall sections can be kept more uniform in thickness. It is the prevalence of excessive temperature differentials occurring over thick and thin wall portions of the bushing that leads to cracking or distortion. The thin sections become the hottest when water-flow is stopped, and yet are the quickest to cool when the flow is re-started.

The superior working performance attained by such *cast* sprue bushings arises, because even though the water supply is stopped, heat can pass most readily from the interior of the bush to the outside surfaces and thence to the surrounding mass of die metal, by normal radiation. Thus localized hot-spots, and unequalized contraction do not occur as easily as happens with a built-up type of bush as shown at Figure 5.

It is customary to manufacture such *cast* chambered sprue bushings from 'Meehanite' cast-iron because of its dense structure and greater freedom from internal porosity and faults. This same metal is very satisfactory for ordinary sprue bushings of design and construction forms similar to those illustrated.

Betty the Martin Girl says...

"I'm no engineer... but I do know MARTIN PRECISION PARTS have the CLOSEST TOLERANCES!"



Martin's Model 74 Heald internal grinder is one of the largest such machines operating in the U. S.

For helpful information about the Martin plant and its facilities, write for our latest descriptive booklet. Inquiries handled promptly.

That's why the die casting industry automatically turns to Martin for components ranging in size from Small Bushings to the Largest Shot Sleeves! All tolerances are held within .0005 of an inch! The industry knows that, regardless of size or quantity, each order at Martin is given the painstaking care and thorough engineering required for this kind of precision. A half-century of specialization, the most modern equipment, plus the cumulative skill (5000 years) of our workmen assure you of the best—efficiently and economically. *All* work is done under the Martin *roof* by Martin processes, with your specific needs in mind.

Martin *grinding and machine works inc.*

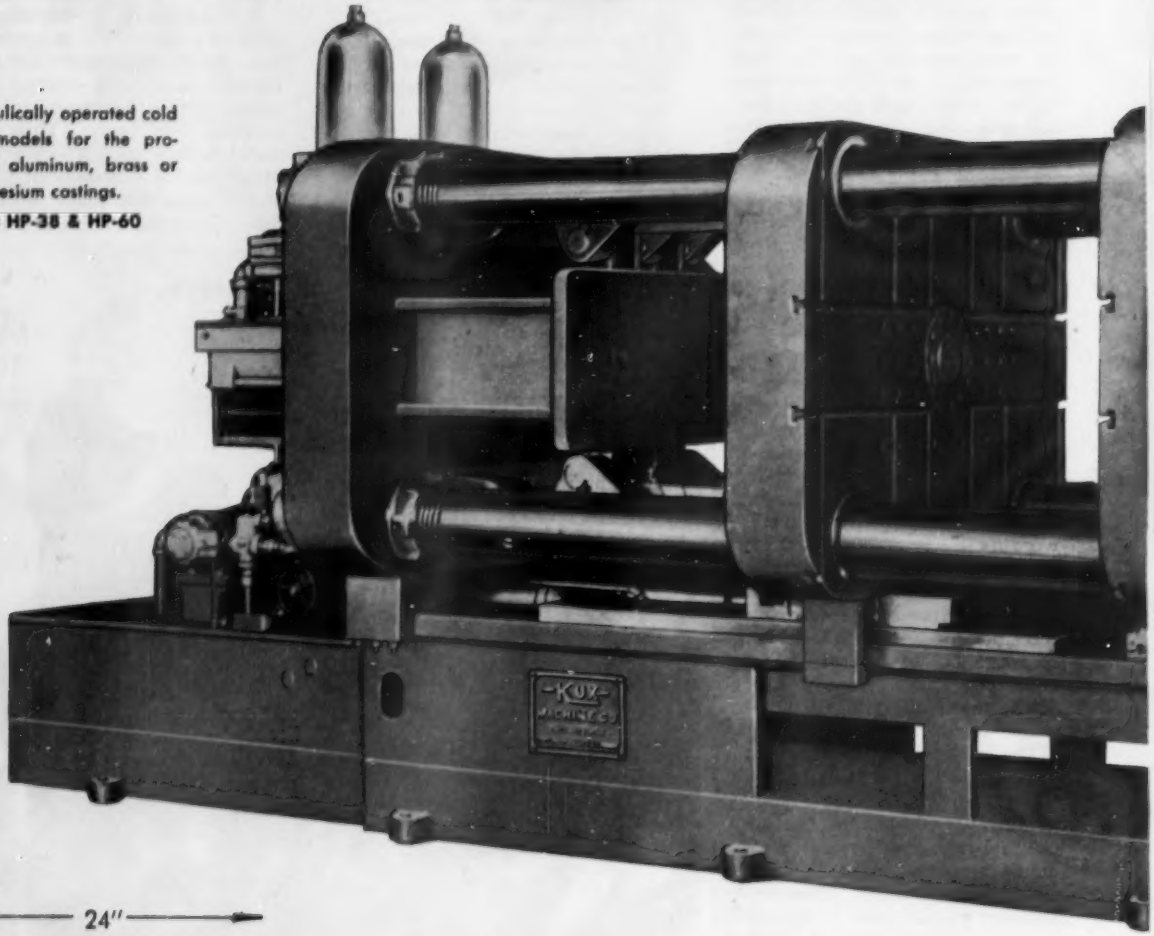
2234 WEST WALNUT STREET • SEeley 3-2154 • CHICAGO

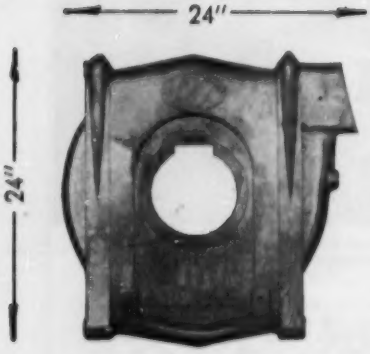
SEE BETTY THE MARTIN GIRL IN PERSON
AT THE NATIONAL METAL EXPOSITION—OCTOBER 8-12

For more information circle No. 114 on the Reader Service Card

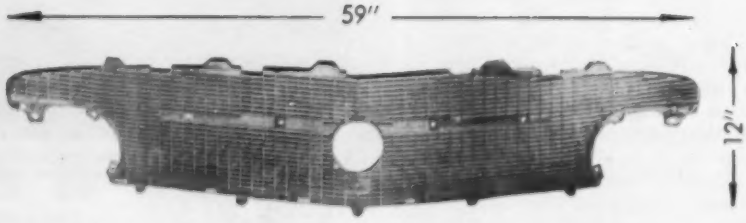
The mammoth Kux

*Kux hydraulically operated cold chamber models for the production of aluminum, brass or magnesium castings.
Models HP-38 & HP-60





Rotary lawn mower housing, a one piece aluminum die casting produced on the mammoth **Kux Model HP-38**



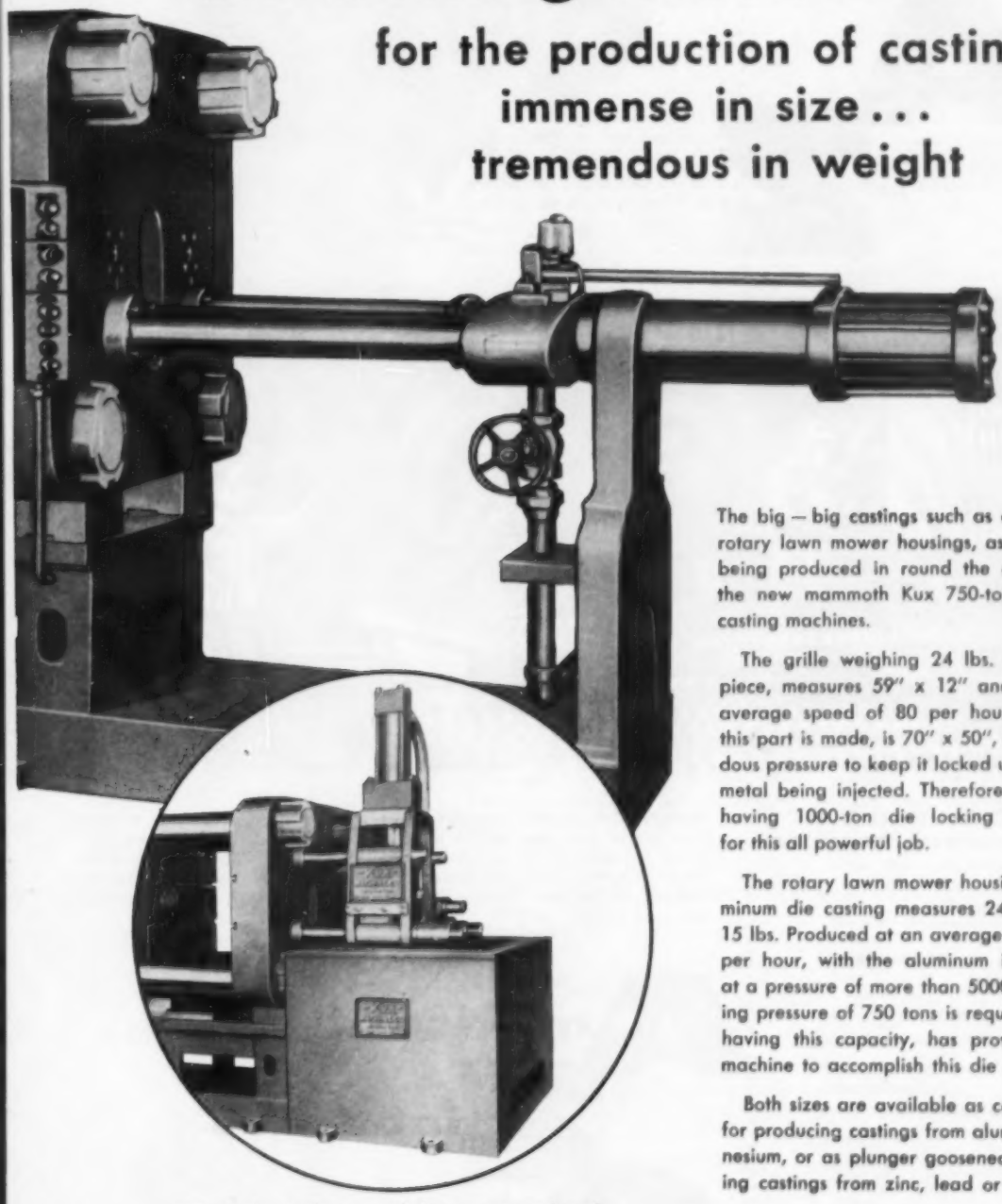
Automobile front grille cast in one piece in zinc on the mammoth **Kux Model BH-60**

ILLUSTRATED ARE ONLY TWO MODELS OF A FULL RANGE OF KUX DIE CASTING MACHINES FROM 25 TONS TO 1000 TONS.

KUX MACHINE COMPANY • 6725 North Ridge Avenue, Chicago 26

750-ton and 1000-ton die casting machines

for the production of castings immense in size . . . tremendous in weight



**Kux hydraulically operated plunger gooseneck models for the production of lead, tin or zinc castings
Models BH-38 & BH-60

The big — big castings such as automobile grilles or rotary lawn mower housings, as illustrated, are now being produced in round the clock operations, on the new mammoth Kux 750-ton and 1000-ton die casting machines.

The grille weighing 24 lbs. in zinc, cast in one piece, measures 59" x 12" and is produced at an average speed of 80 per hour. The die, in which this part is made, is 70" x 50", and requires tremendous pressure to keep it locked under the force of the metal being injected. Therefore, the BH-60 machine having 1000-ton die locking capacity is utilized for this all powerful job.

The rotary lawn mower housing, a one piece aluminum die casting measures 24" x 24" and weighs 15 lbs. Produced at an average speed of 60 castings per hour, with the aluminum injected into the die at a pressure of more than 5000 lbs. PSI, a die locking pressure of 750 tons is required. Thus the HP-38, having this capacity, has proven to be the ideal machine to accomplish this die casting job.

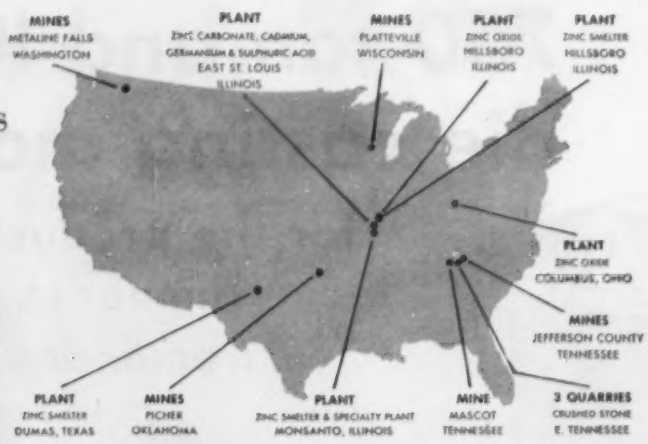
Both sizes are available as cold chamber models* for producing castings from aluminum, brass or magnesium, or as plunger gooseneck models** for making castings from zinc, lead or tin alloys.

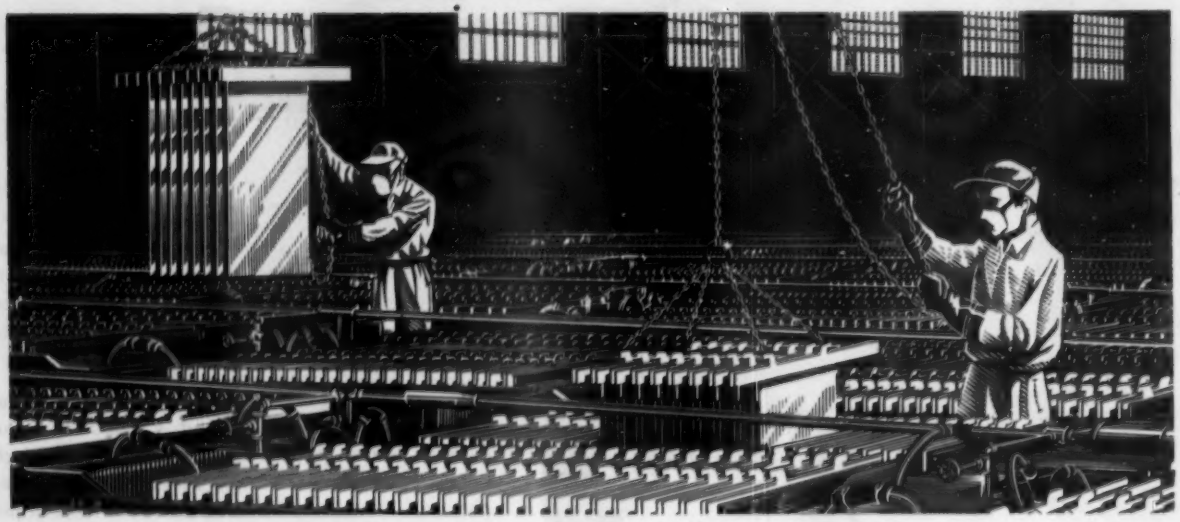
KUX MACHINE COMPANY • 6725 North Ridge Avenue, Chicago 26

For more information circle No. 61 on the Reader Service Card

American Zinc and its products

from A *to* Z





OPERATIONS AT
MONSANTO, ILLINOIS

Modern and recently expanded electrolytic plant producing special high grade slab zinc, which is sold primarily to the die casting and brass manufacturing industries. In conjunction is a specialty plant for the production of zinc ball anodes, heavy plating anodes and anodes for cathodic protection. For complete picture of American Zinc operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

American Zinc sales Company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY

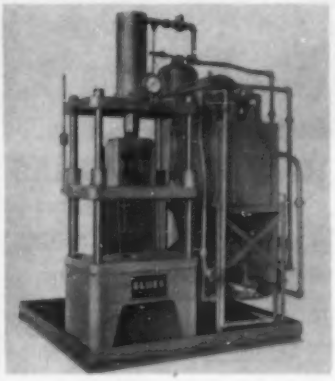
Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

For more information circle No. 8 on the Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Want complete details on these announcements? Use the Reader Service Cards. You'll find them facing page 16 of this issue

HYDRAULIC DIE-CASTER FOR CASTING ROTORS



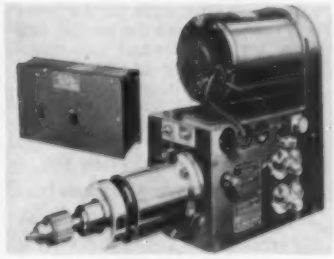
A new hydraulic die casting press is an accumulator-operated unit designed for casting motor rotors by dunking them into a pool of molten aluminum. The entire machine is an integral "package" unit consisting of press, accumulator, pump, valve subplate, and control panel all mounted on a common one-piece base plate.

The unit employs basic principles of automation. The hydraulic circuit is designed for pushbutton operation with the use of a fire-resistant fluid. Using customer's tooling, the operator ladles in the molten aluminum and closes the safety door which initiates the press cycle. Both loading and unloading are automatic.

Other features are: a closely guided press platen held parallel throughout the stroke by the four columns; full pressing force at maximum speed immediately available at contact with the molten aluminum; subplate-mounted valves for easy removal for servicing when necessary; and an electric control panel positioned at the outer edge of the base plate, permitting electrical inspection and maintenance without endangering personnel.

Elmes Engineering Div., American Steel Foundries
For more information, circle No. 190 on the Reader Service Card

DRILL, TAP CHANGEOVER BY FLIP OF SWITCH



Choice of production drilling or tapping by the flip of a switch is now possible with a recently-announced combination drill and tap unit.

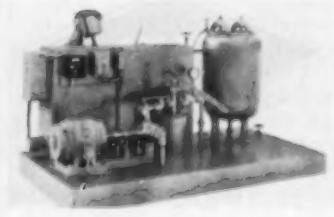
The manufacturer claims that the direct tool approach, in which both drill and tap insert directly into the standard ⅜" capacity chuck, results in less tool overhang, closer mounting to the work fixture, and the use of the same fixture to drill and tap means lower tooling costs.

Changing the direction of tool rotation for tapping is done electrically. No clutches are used and with the control set for tapping, the direction of rotation automatically reverses at bottom of stroke to withdraw tap.

Complete interchangeability is possible where several units are being used as basic heads for rotation on a number of different set-ups. Units are quickly removable by loosening three lock screws on the bracket.

The Dumore Co.
For more information, circle No. 189 on the Reader Service Card

CASTING IMPREGNATOR USES METALLIC SEALANT



Employing a high-pressure system, a new casting impregnator seals porous castings with a metallic sealant, thus eliminating the need for a time-consuming vacuum cycle.

The complete unit covers only 21 sq. ft. of floor space, uses gas, steam, or electricity as a heating medium, and operates on either 220 or 440 volts, A. C. It also employs but one electrical outlet, and can readily be moved from one area to another.

Other advantages listed for the impregnator are compactness, low maintenance cost, and minimum installation time. The equipment has undergone on-the-job use with favorable results. Of all-on-one platform design, it can also be built to specification in all sizes.

Tincher Products Co.
For more information, circle No. 194 on the Reader Service Card

More New Products page 122

MACK TRUCK
Specifies Ep Co
INVESTMENT CASTING
for Vital Part

Bulldog Symbol of Mack Trucks Sturdiness and Dependability

"EPCO Cast lever used by Mack Diesel trucks and buses on hydraulic governor control."

INVESTMENT CASTINGS IN ANY CASTABLE ALLOY EXCEPT MAGNESIUM

Mack engineers specified an EPCO Investment Casting on the above part that was previously machined from ½ inch flat stock.

EPCO Cast in SAE 1045 steel ready for use except for tapping of ¼-20 thread, the lever was made at less cost and well within Mack's high quality standards.

EPCO Cast levers have been in constant use since 1947, and have performed with the same rugged dependability expected in a Mack Bus or Truck.

Get an EPCO quotation before machining or assembling your intricate parts.

Representatives Wanted for Philadelphia, Baltimore and Mid-West.

Ep Co
ENGINEERED
PRECISION CASTING CO.

FREEHOLD RD.
MATAWAN, N.J.

Circle No. 38 on the Reader Service Card

NEW PRODUCTS—cont.

CHROME SEALERS
. . . eliminate plating

Two new chrome sealers for improving the appearance and protection of zinc die castings without plating are now available.

According to the manufacturer, Kenvert #50 is designed to insure bright, clear finishes, excellent corrosion protection, and is highly resistant to fingerprinting and staining. By varying the cycle or concentration of the solution, bright iridescent or a golden brown color can be produced.

Where it is desirable to produce a greenish gray to olive drab film on zinc castings, Kenvert #51 is recommended. This protective coating can be produced in a highly stable bath which is uniformly reproducible. Like Kenvert #50, it offers maximum corrosion protection and is a good base for paint.

Conversion Chemical Corp.
For more information, circle No. 208 on the Reader Service Card

SELF-TUMBLING COMPOUND
. . . for die castings

A new alkaline burnishing compound for zinc die castings has been introduced.

Used for self-tumbling, or with shot or synthetic media, the alkaline liquid compound employs a recommended concentration of the solution of 1 to 2% by volume. Its use is said to produce a brighter finish and to improve the color of zinc die castings. The compound is also recommended for burnishing steel and copper and its alloys.

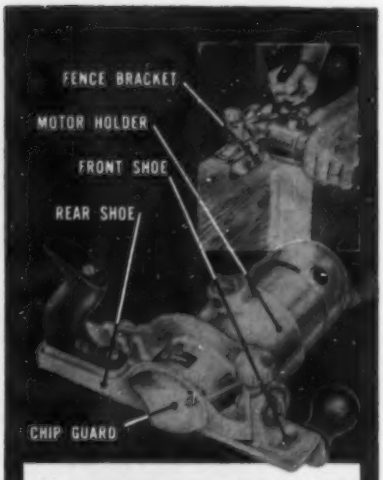
Oakite Products, Inc.
For more information, circle No. 212 on the Reader Service Card

CUTTING OIL MIST
. . . caught with new machine

A compact unit that captures fog, smog, and mist from machine tools using cutting oils has been developed. The machine is offered in two models and in four motor sizes, with volume ranging from 525 to 2685 cu. ft. per min., and motor hp. from ½ to 5.

The filter of the mist collector needs replacing only when suction loss is noted at the hood or vapor is discharging through the filter. Generally, a filter pad will last for weeks or months, depending on the amount of mist.

Hammond Machinery Builders, Inc.
For more information, circle No. 216 on the Reader Service Card



HAMPDEN BRASS
Die Castings have cleaner, smoother surfaces
Machining operations reduced to a minimum on
STANLEY Power Plane

Hampden Brass's engineering department and the Stanley Electric Tool Division worked together to design the H33 Power Plane castings. These aluminum die-cast parts reduce machining time to a minimum. Each casting is of uniform thickness throughout, and all meet high quality standards in production quantities. Hampden Brass solved the problem of intricate coring and thin walls of the front and rear shoe, and the mating surfaces were used as cast . . . eliminating machining at the V-slide match. The result: quality die castings that fulfill every requirement at lower-per-unit cost.

Let HAMPDEN BRASS Help You Solve Your Casting Problems!

Avail yourself of our engineering counsel . . . or write for a casting quotation today!

Send for brochure, "Behind the Scenes" . . . complete digest of Hampden Brass's experience, equipment and facilities.

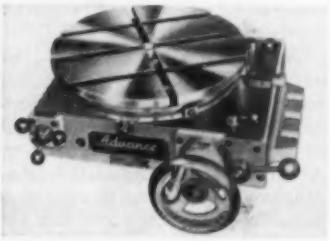
HB

HAMPDEN BRASS
AND ALUMINUM CO.
Established 1903
262 Liberty St.•Springfield, Mass.

Producers of Sand, Permanent Mold, Die & Fiberglas Castings

Circle No. 45 on the Reader Service Card

ROTARY MACHINE TABLES
. . . for close tolerances



A new rotary table has been designed for all types of close tolerance work requiring rotational accuracy to within 30 seconds.

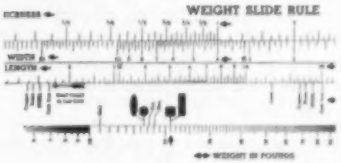
The heavy, rugged rotating table has a 15" diameter working surface with four "T" slots. Other features on the table are precision, tapered roller center bearing and a precision rotating gear cut into solid metal.

The worm and wormshaft are one piece, hardened and ground, mounted on precision bearings; the worm disengagement lever provides instant worm throw-in or throw-out.

All parts operate in an oil bath and the entire unit is self-oiling. The oil reservoir base of normalized semi-steel is sealed against entrance of foreign matter. Rotation stop block and rotational stops may be clamped on any point on periphery and the brake is a floating, internal expanding type that can also be used as a backlash eliminator.

Morrison Engineering Co.
For more information, circle No. 188 on the Reader Service Card

WEIGHT SLIDE RULE
. . . figures any shape



A slide rule has been designed and perfected that instantly figures the weight of any shaped object from known dimensions. Calculations cover most materials, including aluminum, cast iron, steel, brass, copper, and lead.

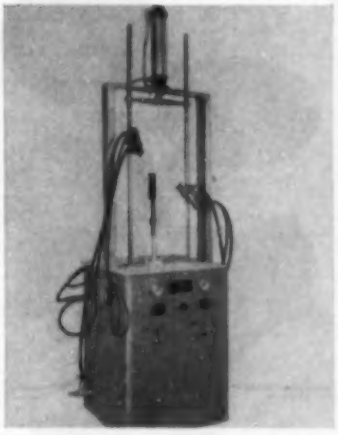
Almost any shape can be figured, from rounds, squares, hexagons, and fillets to prisms, balls, hollow cylinders, cubes, etc.

The weight slide rule is also handy when working in reverse. For instance, if a product is to be profitable and weighs less than 20 lbs., the slide rule accurately indicates the limitations within which the measurements must fall.

The anodized aluminum face of the rule has black graduations with no-glare reading. An instruction book is included which shows methods of solving typical problems by using the slide rule.

American Pattern
For more information, circle No. 222 on the Reader Service Card

SPRAY PAINTING MACHINE
. . . has great flexibility



A new, automatic machine for spray painting of cylindrical and rectangular parts, such as model trains, statuettes, toys, tubes, bottles, etc. has been developed.

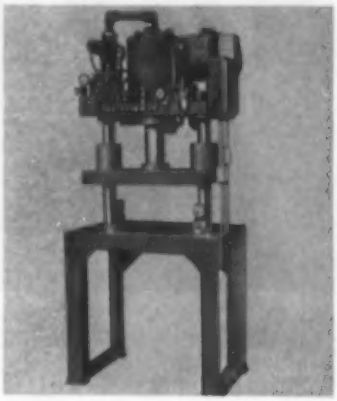
Possessing great flexibility, the machine has vertical traveling guns which can spray either on the downstroke or on both down and upstroke, and a rotating spindle workholder which can also be set stationary.

The machine is air operated and has a low-pressure hydraulic cylinder drive for smooth gun travel. The speed of the gun is adjustable in both directions, and a spindle stopping-locating device makes loading and unloading of work easier.

The unit comes complete with two automatic spray guns, speed controls, atomizing air regulator, and necessary hoses and connections. The air operated valves and other moving parts are automatically oiled.

Conforming Matrix Corp.
For more information, circle No. 192 on the Reader Service Card

20-TON TRIM PRESS
. . . runs on 3 HP



A 3 hp. motor is all that is required to operate a new high-speed 20-ton hydraulic press designed specifically for trimming die castings.

The press is engineered and designed around the parallel strain rod, guided platen principle. With special electrical and air controls, its hydraulic circuit is quiet and practically shock-free in operation.

The press requires relatively little shop space. The entire area around it is free and open for use of conveyors, chutes, barrels, buckets, and other means of handling parts and castings. All connections to power, air, and water are attached at the top instead of the bottom of the machine.

The press also can be used for broaching, staking, swaging, stamping, shearing, blanking, and forming. It can also be used as a dwell press for curing or explosive packing. The hydraulic system is a closed, balanced circuit and requires less than 10 gals. of fluid to be filled to capacity.

The Mohler Engineering Co.
For more information, circle No. 191 on the Reader Service Card

STRING BUFFS
. . . to polish aluminum

A new line of string buffs of long fiber cotton strands are said to be tougher than the re-processed or waste yarn usually used. They are said to withstand the effect of frictional heat and disintegration better and to give more surface feet of buffing than previous bobs.

Schiegel Manufacturing Co.
For more information, circle No. 206 on the Reader Service Card

More New Products page 124

Titan

brass pressure die castings

- cut fabrication costs
- simplify secondary machining
- are made in complex shapes
- have consistent uniformity
- allow large weight savings
- increase production rates

A pioneer in manufacture of brass pressure die castings, Titan can supply these parts to meet your requirements. Little or no secondary machining operation is needed on Titan pressure die castings. Intricate shapes and deep cored holes are readily produced, are consistently uniform. To save weight, wall sections as thin as .070 inches are generally feasible; but 1/32 inch section is possible if not too large in area. Machine scrap is reduced, and your fabrication costs cut. Moreover, the better surface finish, sharper outlines, greater accuracy, higher strength, and finer grain structure of Titan brass pressure die castings make them unquestionably superior to sand and other types of castings.

Anyone of these versatile advantages may be reason enough to specify Titan brass pressure die castings as components in your finished product. Find out what Titan can do for you.

Send for 12-page booklet on Titan brass pressure die castings

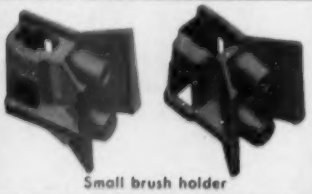
Titan®

METAL MANUFACTURING CO.
BELLEFONTE, PA.
Offices and Agencies in Principal Cities
RODS • FORGINGS • DIE CASTINGS
WELDING RODS • WIRE

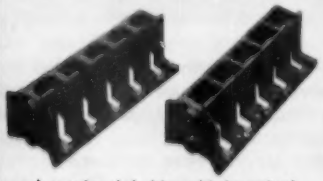
VISUAL PROOF

These photos demonstrate how little secondary machining is required on typical Titan pressure die castings. In each case a part as cast and trimmed only, and the same part machined are shown.

Flywheel for garbage disposal unit



Small brush holder



Large brush holder with broached holes held to close tolerance

Overflow plate and trip handle

Shower head

For more information circle No. 92 on the Reader Service Card

MULTI-HEAD SPINDLES
. . . have flexible shaft

Featuring flexible shaft drives for the spindles, a new adjustable, multiple head permits a wide range of hole patterns with a smaller drive-to-spindle distance than with conventionally geared heads.

The flexible shafts have been developed specifically for tapping and drilling and are said to operate at high speeds without vibration or danger of unraveling. Accurate positioning of the spindles is accomplished by means of adjusting arms which can be moved in and out or transversely while the unit is operating.

The Model 800 head offers a wide range of adjustment and can be used horizontally or vertically for both tapping and drilling. Conversion from drilling to tapping requires addition of a standard tapping face plate and the replacement of drill collets with interchangeable floating tap collets. A 1:1 drive ratio permits the unit to be used for lead screw tapping.

Ettco Tool Co., Inc.
For more information, circle No. 218 on the Reader Service Card

END MILL SERIES
. . . for aluminum

A new series of 23 sizes and styles of end mills for aluminum and its alloys has been announced..

The new cutters are standard with right-hand cut and right-hand spiral flutes. For rapid disposal while plunge cutting, they are manufactured with higher spiral flutes than conventional cutters and feature full end teeth to permit grinding various radii as required.

Included in the new series are several cutters featuring a 1½" shank diameter for additional reach and rigidity on plunge cutting and profiling operations in aircraft and other industries.

The end mills have a 4" and/or a 6" length of cut.

Goddard & Goddard Co.
For more information, circle No. 217 on the Reader Service Card

TWO-WHEEL CART
. . . for castings, chips, etc.

A low cost materials handling cart for transporting small parts, chips, shavings, clippings, etc. has been introduced.

With an overall height of 20",

the cart has easy clearance under work benches, hoppers, feeders, or machine tools. The bin type design makes for easy loading and dumping.

Its short turning radius and low center of gravity give it maneuverability.

The cart body is mounted on two 8" roller-bearing wheels and one 4" swivel caster. Either solid steel or rubber tired wheels are available for the 95-lb. cart.

Coolant Equipment Corp.
For more information, circle No. 207 on the Reader Service Card

RECOVERY OF CHROMIC ACID
. . . from plating, anodizing & stripping baths

A patented method for recovering contaminated or spent chromic acid solutions has been developed and is being made generally available. No formal license is required.

The process involves ion exchange treatment for the removal of metallic contaminants of iron, copper, aluminum and other metals by passing solutions through a cation exchange resin consisting of sulfonated infusible polymerizate of a polyvinyl aryl compound. Such treatment on a hydrogen cycle permits recovery of baths which have become inoperable due to excessive metallic contamination or reduction in acidity.

Allied Chemical & Dye Corp.
For more information, circle No. 210 on the Reader Service Card

NON-ORGANIC STRIP COAT
. . . protects many finishes

A new type of strip coating has been developed to protect various finishes, surfaces, and machined precision parts from marring or scratching during processing, shipment, and storage.

Smooth or wrinkled metal finishes, enameled and lacquer finishes can be coated.

The coating, called Strip-Kote, contains no organic solvents and is a milky colored, latex type of emulsion which can be applied by brush or spray gun. The film becomes transparent, tough, and flexible after air-drying for 20 to 30 minutes. Coverage will vary according to the thickness of the film deposit but claimed coverage is 250 sq. ft. per gallon for an .008 in. film.

Chemical Consulting Service
For more information, circle No. 215 on the Reader Service Card

For more information circle No. 1 on the Reader Service Card

NEW!

HIGH SPEED A.B.C. DIE CASTING MACHINE

Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs.

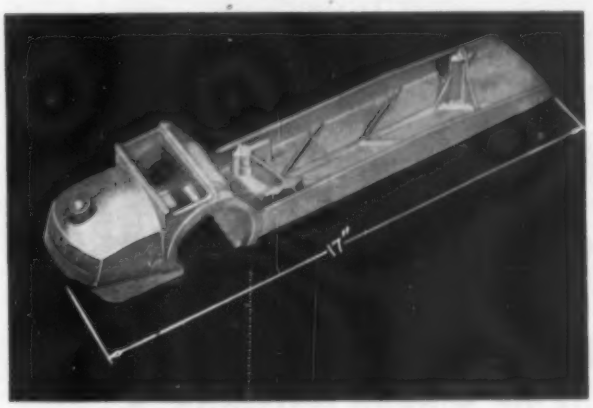
The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:
- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFETY SHOT INTERLOCK

Write today for engineering data and prices. Ask for bulletin A-10.

A B C

DIE CASTING MACHINE CO.
400 E. 142nd ST. • DOLTON, ILL.



Aluminum lightness, cast in inserts, accuracy, and die casting smoothness make this housing ideally suited for a modern electric planer.

Federal
DIE CASTING COMPANY
2220 NO. ELSTON AVE. CHICAGO 14, ILL.
Phone ARmitage 6-4003

For more information circle No. 39 on the Reader Service Card

TECHNICAL DEVELOPMENTS

continued from page 60

lids for cars, window frames and other architectural shapes, and many other items.

Vacuum die casting: The idea of pulling air from a die prior to injecting molten metal has long intrigued the die casting industry. If all gases could be evacuated ahead of the flow of metal, then entrapment of air, with its resultant porosity, could be eliminated. Many advantages have been foreseen coming from such a development.

Previous attempts to achieve this have failed: casting cycles have been too slow, maintenance problems have been excessive, or the machines have been too difficult to operate in production. A new system has now been made available using standard die casting machines, and already several segments of the die casting industry are turning to it for possible solution to some of their most troublesome castings.

The Vacucast process (See PMM Jan. 1956, pg. 45) introduced by Nelmor Manufacturing Company, is now available as standard equipment on machines built by Reed-Prentice Corp. Within the past few weeks, the first production model of this unit has been completed and put through its trial paces.

What do the manufacturers claim for their new vacuum die casting machine? They say it operates at even faster cycles than do conventional hot or cold chamber units, that it produces castings that are free of the type of porosity particularly troublesome in quality electroplating or pressure tight applications. They point to lab tests showing some increase in physical properties, and to heat tests which reveal freedom from porosity conditions.

While the system has been in operation for two years turning out zinc die castings on a production basis, its use to achieve the automatic injection of aluminum or magnesium has yet to be put into the test of full-scale production.

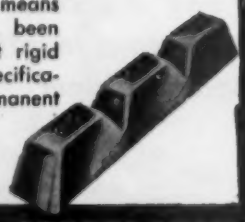
In this machine, the furnace is connected to the shot sleeve by a stainless steel or ceramic pipe. By changing the connection from one furnace to another, the switch in alloys is made. Since the molten aluminum is pulled from the center of the pot by vacuum directly into the shot sleeve in about ¾ of a second, a much faster operating cycle is expected.

Some of the potentials being investigated: the possibility of die casting an anodizable aluminum alloy which has not previously been die cast successfully, the die casting of magnesium alloy and copper alloys without cold chamber.

Accessory equipment: Higher production rates and larger castings have brought up some innovations in the auxiliary equipment in the die casting shop. Each of these has an important influence on casting costs, devices that deliver measured quantities of molten alloy to the shot sleeve of a cold chamber machine, thus saving, hand ladling with all its inefficiencies, have been put into production by two manufacturers of furnaces, Ajax Engineering Corp. and Lindberg Engineering Co. In addition, the vacuum die casting machine mentioned above pulls a controlled shot of metal without ladling.

When You Think of
ALUMINUM
BRASS & BRONZE
Think of Sonken Galamba

The initials "S-G" on aluminum, brass or bronze ingot means uniform quality that has been produced to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast, you can be confident with "S-G" ingot.



SONKEN GALAMBA CORPORATION
Riverview at 2nd Street • Kansas City 18, Kansas

For more information circle No. 88 on the Reader Service Card

OHIO
this is precision casting!

This casting, of OPC 356 Aluminum, heat treated, is produced for The Morse Instrument Co., manufacturers of photographic and marine equipment.

The long, narrow opening running through the center of this casting is just .0625" wide. For its entire 7⅜" length, OPC maintains this width exactly, within a tolerance of ±.005".

Accuracy in the most intricate detail is just one advantage of using OPC castings. Another is the smooth finish that eliminates hours of machining time. Still another is durability. You can get all these, plus strict adherence to your print specifications, prompt quotation and delivery AND overall lower costs, when you check first with OPC.

We have an illustrated brochure that contains several interesting examples of small parts production savings in a variety of industries. May we send you a copy?

OPC
OHIO PRECISION CASTINGS, INC.
P. O. Box 55—Station A • • • DAYTON 3, OHIO
Plaster Mold Castings made from
BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

For more information circle No. 78 on the Reader Service Card

As castings have gotten larger, the job of removing them from the die cavity has been more difficult. Mechanical devices have been worked out to take care of this chore. One device for removing castings automatically is called the Planobot manufactured by Planet Corp.

Finishes: The availability of suitable finishes has an important influence on the use of die castings. Improvements in materials for gaining paint adhesion, new developments in chromium plating, and the possibility of applying color anodizing for decorative purposes: each has a bearing upon design and specification of die castings.

Recent development of chromium plating without porosity by United Chromium may have important aspects for decorative and protective plating of die castings. It is now being used or considered for many types of decorative hardware finish.

Great efforts are being extended in the direction of color anodizing of aluminum die castings. Not only the new alloy referred to in this month's PMM, but many other attempts are being made.

Recently announced also is a research project undertaken by Battelle Memorial Institute under auspices of the American Zinc Institute to improve finishes available for zinc die castings, with special attention to anodized finishes.

MAGNESIUM PRICES RISE

Following settlement of a strike by agreement on a new contract, Dow Chemical Co. has announced upward revision of its prices for primary magnesium and magnesium products. Primary pig and ingot prices were upped 1½¢ a pound at shipping points, wrought products were raised 5% and alloys up from 1½ to 3¢ per pound. New prices were effective August 13.

PRODUCERS' OPINIONS

continued from page 56

W. J. DURING, President
Precision Castings Company, Inc.

". . . as far as new developments in alloys and methods of die casting are concerned, the future seems bright. There are a number of things being checked into and some of them show promise. However, they are not sufficiently along to release any firm factual information."

". . . new applications for die castings are cropping up every day. Because of the tremendous technological improvements and advances being made in industry, the field for die castings is continually expanding."

". . . as far as size and intricacy of castings is concerned, they are getting bigger and more complex every day. I put in a four by eight foot work table, hoping that would be the right size for blue prints in front of my desk, now it's too small. Parts that were formerly an assembly of two or more large pieces are now being considered as a single casting. Transmission housings are an example of the growing size I mention."

". . . the designer and buyer of castings today is doing a good job on the type of parts that are considered normal and average. On the newer and larger parts, there is still need of close consultation between the designer and producer. These parts are trying new fields and new ideas for which there is no background or precedent so that there is no good guide for the designer to follow."

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How you Can Save Time Measuring Surface Temperatures in Your Plant with

ALNOR PYROCONS

The Alnor Pyrocon combines laboratory precision with production tool ruggedness to give you fast, accurate answers to all surface temperature problems. It takes just 3 seconds to give you the temperature of any surface. . . regardless of shape or material. . . revolving or stationary. And the heavy, shock-resisting movement is housed in a balanced unit that's compact, easy to handle.

Mail this ad with your business letterhead to Illinois Testing Laboratories, Inc., Room 547, 420 N. LaSalle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

For more information circle No. 55 on the Reader Service Card

Ready to Deliver Highest Quality

Smelters Aluminum Alloy

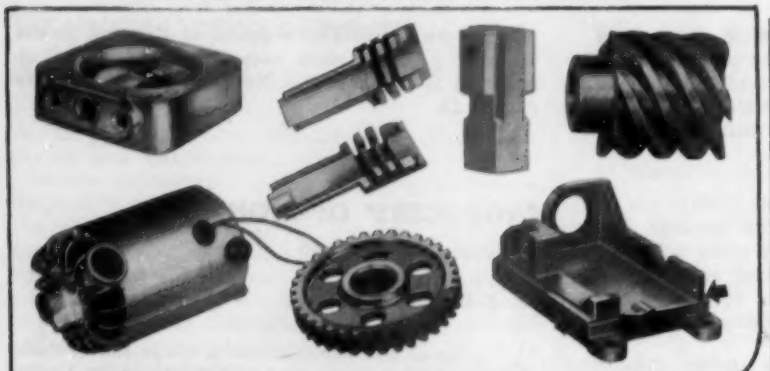
For die casting, permanent mold casting and sand casting. Our alloys are rigidly controlled to meet the most exacting specifications.

• We also produce hardeners in ingot and shot form for use in zinc base die casting alloys.

General Smelting Company

2901 EAST WESTMORELAND ST., PHILADELPHIA 34, PA.

For more information circle No. 44 on the Reader Service Card



DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

DATA IN ADS

continued from page 18

92. **Brass Die Castings**—to give all of the advantages of a pressure die casting with brass as the material are described in a 12 page booklet available from Titan Metal Mfg. Co.

95. **Pilot Plant Casting**—In a new bulletin, DB-52-500, Westinghouse Electric Corp. discusses the facilities for pilot plant casting production and prototype manufacture in the new metals plant.

98. **Finishing Non-Ferrous Metals**—Detailed laboratory and engineering reports on the finishing of non-ferrous metals by the Iridite process are available from Allied Research Products, Inc.

99. **Barrel Finishing**—by the Abbott method is described in literature from The Abbott Ball Co.

100. **Special Air Cylinders**—Air cylinders with built-in valves are featured in two bulletins from The Bellows Co.

101. **Painting With Masks**—Literature on spray masks, mask washers, automatic spray painting machines and clamps and fixtures is available from Conforming Matrix Corp.

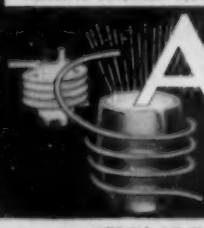
MAKE PRECISION ALLOYS IN AJAX INDUCTION FURNACES

At the Edmore, Michigan, foundry of General Electric's Carboloy Department, all the critical Alnico alloys are made in Ajax-Northrup induction furnaces.

Electromagnetic fields stir the molten metal, rapidly distributing every element of the charge throughout the melt. There's no contamination, and scrap is almost 100% recoverable. Temperature and melting speed are easily controlled by varying power to the furnace.

No wonder industry continues to choose Ajax-Northrup induction heat—as it has for forty years—for every type of melting installation. Write Ajax Electrothermic Corporation, Trenton 5, New Jersey, for details.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



AJAX NORTHRUP SINCE 1916
INDUCTION HEATING-MELTING

SEE US AT THE METAL SHOW — BOOTH 1609 (In the Arcade)

METAL POWDERS

Molybdenum
Cobalt
Tungsten
Tungsten-Carbide
(COATED & UNCOATED)

SUPERFINE

MICRONIZED METALS, INC.

SUPERPURE

MEMBER mpa METAL POWDER ASSOCIATION

38-13 TENTH STREET
LONG ISLAND CITY 1, N. Y.

102. Multiple Tapping—of up to 8 holes at a time can be done with the Multi-Tapper. The production tool catalog from Commander Mfg. Co. describes and illustrates this new equipment.

105. Low Cost Finishing—The advantages of barrel finishing to give hand-buffed results at barrel finishing costs are given in "Facts and Figures Report on Honite Barrel Finishing" from Minnesota Mining & Mfg. Co.

106. Machine Deburring—of inaccessible holes can be done with Nobur tools. A complete catalog of these special tools is available from Nobur Mfg. Co.

107. Coating For Aluminum, Zinc—with increased corrosion resistance is possible with the ChromiCoat Process as described in bulletin B4728 from Oakite Products, Inc.

109. Deburring, Surface Finishing—and other metal removal and surface improvement operations can be done with blast cleaning. This type of equipment is described in bulletin 1403 from Pangborn Corp.

13. Precision Investment Casting—Information has been prepared by Arwood Precision Casting Co. that is especially written for design and production engineers. Design factors, costs, etc. are discussed.

55. Surface Temperatures—Fast, accurate measuring of surface temperatures is possible with Alnor Pyrocons, according to an illustrated booklet from Illinois Testing Laboratories, Inc.

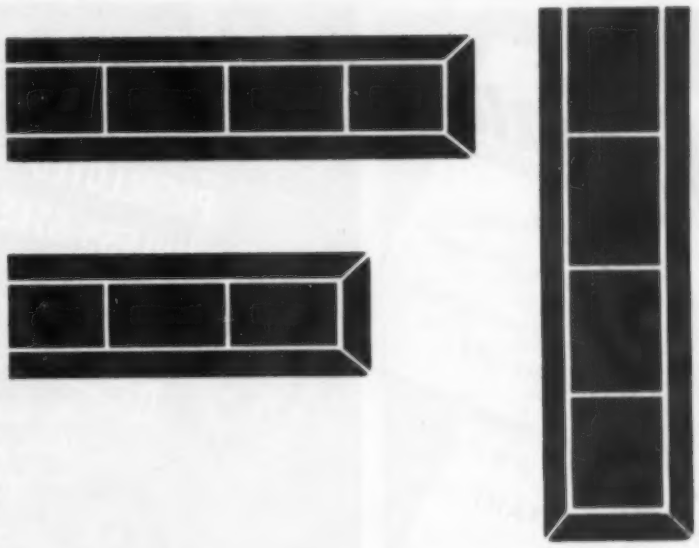
73. Machine Tables—Two rotary tables that are said to reduce set-up time and give accuracy to 30 sec. are described in literature from Morrison Engineering Co.

85. Iron Powder Advantages—Iron powder with controlled and reproducible dimensional changes is discussed in literature available from the Republic Steel Corp.

97. Heat Exchangers—Bulletin HT-1 from Yates-American Machine Co. gives detailed information on fixed-bundle heat exchangers which are said to give greater capacity per sq. ft. of surface.

104. Barrel Processing Compounds—Complete data is offered by Magnuson Products Corp. on their various Permag compounds for barrel tumbling, coloring, and deburring.

110. Automatic Tapping—for long production runs with repetitive thread accuracy, fewer broken taps, and other advantages is the subject of a brochure from Procunier Safety Chuck Co.



Because your business is important to us our Die-cast Ingot salesmen are specialists

The next time your Federated salesman calls on you, give him a few minutes of your time. You'll find his friendship and interest rewarding. If your problems are highly technical, the Federated salesman will introduce you to a Federated Service Engineer. He is equipped to study and advise on your production procedures.

With five conveniently located plants producing aluminum and zinc die-casting metals, we regard the die-casters as an important segment of our business. To retain the good will of the industry, we must and do provide a quality product and support it with sales and service facilities without equal.

The use of these facilities and services costs you nothing.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead, Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

For more information circle No. 40 on the Reader Service Card

Circle No. 64 on the Reader Service Card

La France

TRADE MARK REG. U.S.A.

FRANLUBE ®

- Aluminum die casting lube
- Zinc die casting lube
- Plunger lube

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- Plunger tips & sleeves
- Die casting dies

La France

MANUFACTURING CO.

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ST. LOUIS 21, MO.

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speaking of quality . . .

PREALLOYED STAINLESS STEEL POWDERS

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For Outstanding Structural Parts, Porous Media and Self-Lubricating Parts Requiring Any or All of These Properties . . .

- SUPER-CORROSION RESISTANCE
- HEAT RESISTANCE
- HIGHER DENSITY
- HIGH DEGREE OF HARDNESS
- HIGH IMPACT STRENGTH
- HIGH TENSILE STRENGTH

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producers of

prealloyed metal powders and pigments

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SERVICE IN ALL MELTING PROBLEMS WHERE FLUXES ARE USED

PROVEN USED BY DIE CASTING PLANTS FOR MORE THAN 15 YRS.

New SMOKELESS ZINC FLUX LATEST DEVELOPMENT

ZINCOREX "DT"

has been improved to give your metal more fluidity and to prevent sluggishness. Zincorex "DT" does away with obnoxious ingredients, will not absorb water, reduces fumes. Application of Zincorex "DT" gives you:

1. increased fluidity of metal
2. lower rejects and faulty castings
3. savings of metal (retained free of dross)

ALUCO "S"

is designed specifically for die casting aluminum base metals. With it, you can be sure of: reduced oxidation; removal of non-metallic inclusions; sound castings with minimum rejects.

Write for free samples and technical data.

Atlantic Chemicals & Metals Co.

1921-27 N. Kenmore Ave. • Chicago 14, Illinois

STROH'S

NEW PLANT "FILLS the BILL"

for the production of zinc die castings which are the last word in structure, design and performance. In our expanded quarters we have installed the very latest equipment to serve you better and faster. As one of the oldest die casting firms in the midwest we would welcome the opportunity to quote on your requirements. INQUIRIES INVITED

STROH DIE CASTING Co. INC.

11123 W. Burleigh St., Milwaukee 10, Wisconsin

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For more information circle No. 89 on the Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

ALLOY PRECISION LEASES NEW PLANT

A new 23,000 square foot plant at 3855 West 150th Street in Cleveland, Ohio, has been leased by Alloy Precision Casting Company, manufacturer of investment castings, it has been announced by Frank W. Glaser, executive vice president and general manager.

Operations in the new plant began on August 15, and all production facilities from the Company's factories at East 45th and Hamilton Avenue and 13721 Bennington Avenue, both in Cleveland, have been moved to the new plant.

Alloy Precision Castings Company produces castings by the Mercast process, employing frozen mercury for the disposable patterns.

The company has recently added a "lost wax" division, making use of special waxes or plastics as disposable patterns for the production of investment castings. The company is the only producer of investment castings using both methods of precision castings on a commercial scale.

MT. VERNON DIE CASTING ADDS 20,000 SQ. FT.

The Mt. Vernon Die Casting Corp., after celebrating its 50th anniversary, is at present making extensive alterations and adding 20,000 square feet additional space to its present 162,000 square foot plant.

The new extension is being built for the exclusive use of zinc and will be the last word in alloying and fabrication. It will be possible in many cases with this new set up to alloy, cast, trim, etc. and ship castings the same day.

SELL PATTERN SUPPLIES

Shallway Corp. has announced the establishment of a shell mold pattern supplies division at its Shalco Demonstration Center, Connellsville, Pa. The new division will carry a complete line of pattern accessories and supplies as a service to shell mold pattern-makers.

AUSTENAL LAB CHANGES NAME

The name of Austenal Laboratories, Inc., has been changed to Austenal, Inc. to reflect the wider range of the company's activities, Charles H. Prange, president, has announced.

Austenal, a leading producer of investment castings, has headquarters in New York and plant facilities in Chicago and Dover, N. J.

BUILD ZIRCONIUM PLANT

Horizons Incorporated, Cleveland, has been engaged by the Kennecott Copper Co., New York, as consultants on the design, erection, and operation of a pilot plant in Cleveland for production of zirconium. The plant marks the first non-government sponsored piloting of this nuclear metal.

BECOMES VACUUM DIVISION

Optical Film Engineering Co. has become the Vacuum Equipment Division of the New York Air Brake Co. Richard A. Denton and Thomas L. Scatchard, founders and partners of the former company, will head the management of the new division. Enlarged manufacturing, research, and optical coating facilities are now being completed.

AMERICAN ZINC INSTITUTE IN LARGER HEADQUARTERS

As of August 27, The American Zinc Institute, Inc., occupied new and larger offices in Suite 2020 of the Lincoln Building, 60 East 42nd Street, New York 17, N. Y., it was announced today. The AZI phone number will remain unchanged: MUrray Hill 2-2633.

KEMPTON ROLL APPOINTED M.P.A. SECRETARY

The Metal Powder Association has announced the appointment of Kempton H. Roll as the Association's first full-time executive secretary and treasurer. At the same time, the Association has occupied new offices located at 130 West 42nd Street, New York 36, N. Y., telephone WIsconsin 7-0645.

Kempton H. Roll

According to MPA Directors, this came about as a natural result of expansion of the Association's activities and growth of its membership since its founding twelve years ago. The Metal Powder Association began with 19 companies and now numbers more than 71, including several concerns in England, Canada and Japan.

It represents all industries interested in the advancement of powder metallurgy, and includes the suppliers of metal powders, the fabricators of self-lubricating bearings, structural parts, friction materials, iron powder electronic cores and ferrites electronic cores. Associate members of MPA include the manufacturers of equipment used in powder metallurgy such as presses, sintering furnaces, gas atmosphere suppliers, tool and die makers, as well as consultants in powder metallurgy and some of the leading publications in the field.

Mr. Roll began his professional training at Carnegie Institute of Technology, later transferring to Yale University where he received his B.S. in Metallurgical Engineering. He was elected to Sigma Xi and Alpha Chi Sigma professional fraternities. During World War II, he served in the the U. S. Navy as a Bomb Disposal Officer. He was first employed by the Magnolia Metal

Continued on page 132

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aluminum . . .
▶ permanent mold castings
▶ die castings

Full Permanent Mold

Undercuts Cast Without Sand Cores

Savings Over Sand Castings Pay For Tooling On First Order

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Company as Research and Production Metallurgist, leaving to join the Lead Industries Association and Metal Powder Association in 1948 as Staff Metallurgist. During this period, he received his M.S. in Metallurgical Engineering at the Polytechnic Institute of Brooklyn.

He has authored numerous technical papers on lead and its alloys and on powder metallurgy, and participated in the activities of the National Association of Corrosion Engineers, the American Institute of Mining, Metallurgical and Petroleum Engineers, the Society for Nondestructive Testing, the American Society for Testing Materials and many other technical organizations.

He currently is Chairman of both the New York Section of the American Society for Metals and the A.I.M.E. New York Powder Metallurgy Group. He recently served as General Conference Chairman of the 1956 International Corrosion Conference sponsored by the National Association of Corrosion Engineers. At the time of his new appointment, Mr. Roll was Technical Director of both the Metal Powder Association and the Lead Industries Association.

You get OVER 100,000 SHOTS per set with AUTO-DIESEL PLUNGER RINGS

A new Auto-Diesel development is a Hardened Steel Plunger Ring that will last for MONTHS instead of HOURS. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). Maintenance and down-time are reduced to the minimum. They are made of cast iron, dieloy cast iron or hardened steel. Anyone operating die casting machines or casting zinc parts can save money. It will pay to write for details.

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Down-time is always costly in many ways. This can be reduced to the minimum by using AUTO-DIESEL 2 or 3 Piece Plunger Segment Rings. They will give you LONG LIFE. Made of high grade wear resisting iron in sizes from 1½" to 4" for hot chamber die casting machines.

Write for Details

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3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES Since 1921"

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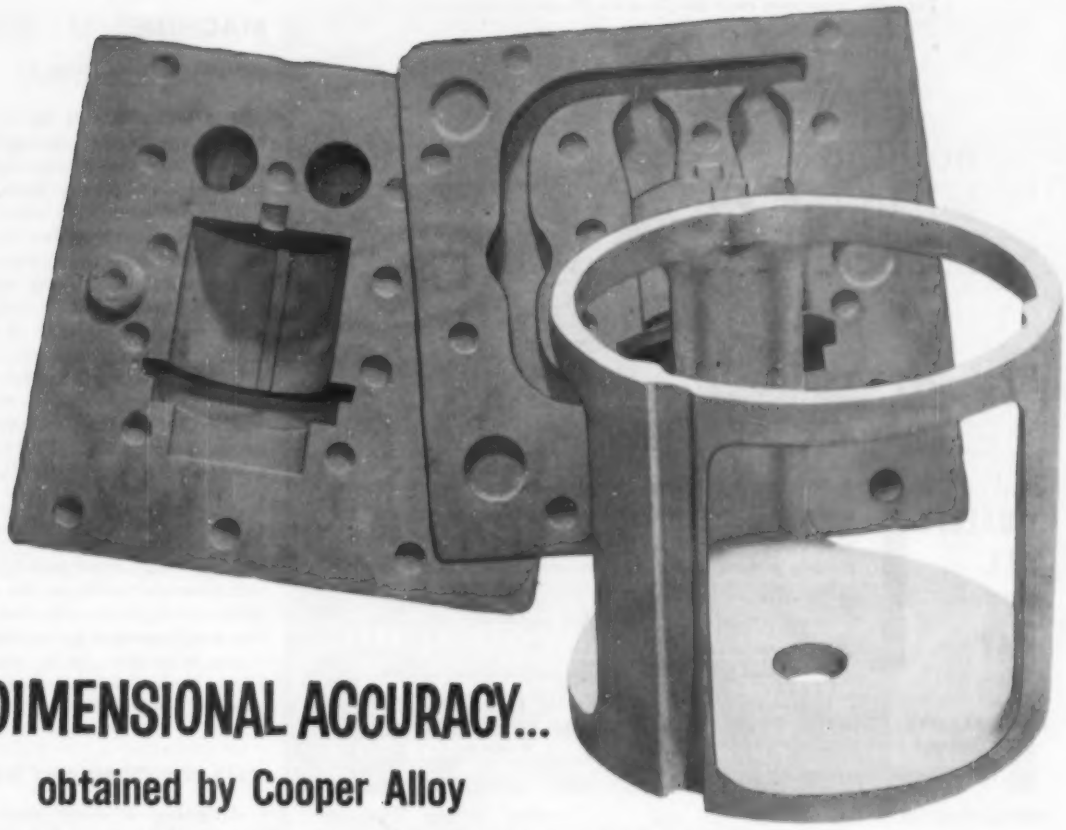
NEW DIE CASTING PLANT

New die casting equipment with 500-ton locking pressure has been installed at the newly-opened plant of Aluminum Fabricators, Inc., manufacturer of precision aluminum die castings. The single story, 8,000-sq. ft. plant is located at 202 W. Bennet St., Saline, Mich., and is said to be completely equipped for all types of job shop assignments.

SERVICES EXPANDED

Four research personnel of the Dow Chemical Co. have been transferred to the company's magnesium technical service & development group for work on finishing projects of individual customers. At the same time, the cathodic protection sales group has been further staffed to assist customers in projects utilizing magnesium anodes. The move is part of the company's expansion of finishing and cathodic protection technical services for magnesium users.



DIMENSIONAL ACCURACY...

obtained by Cooper Alloy

through SHELL MOLDING with G-E Shell Molding Resins

This stainless steel instrument housing, cast for a customer by Cooper Alloy Corporation, Hillside, N. J., was one of those "impossible" jobs. Previous experience by the customer had resulted in shrink defects in the lugs on the open face, rendering the castings unacceptable. The job was further complicated by the fact that dimensions and finish were equally critical on both exterior and interior surfaces.

Through shell molding and advanced foundry techniques, Cooper Alloy was able to convert this "impossible" job to a standard production run! Hollow shell cores achieved the required accuracy and finish for the casting's interior; the Shellcast* process accomplished similar results for the exterior. G-E shell molding resins helped Cooper Alloy obtain close dimensional accuracy, fine finish and uniform soundness.

How can shell molding help YOU?

Cooper Alloy uses *General Electric shell molding resins* in its Shellcast process, relying on them for batch-to-batch uniformity and correctly balanced properties. Other G-E products for shell molding include: *G-E silicone release agents* to release molds easily from patterns and *G-E phenolic bonding resin* to assemble shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G.E. about shell molding!

General Electric maintains a shell molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

*Reg. trademark, Cooper Alloy Corporation

FREE SHELL MOLDING MANUAL!

General Electric Company
Section 6F4C2
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*

( ) We are presently using the shell molding process.
( ) We are interested in the shell molding process.

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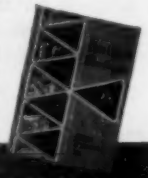

Haviland PRODUCTS COMPANY
421 Ann Street, N.W. Grand Rapids 4, Michigan
Manufacturers of processing chemicals for the metal trades

For more information circle No. 46 on the Reader Service Card

MACHINES

continued from page 62

Is a standard test needed? An effort was made during recent months to revise the grouping of categories of locking pressure in PMM's tabulation to show more clearly the competitive types of machines available. However, one major stumbling block encountered is the lack of an industry-wide standard method of determining locking pressures.

Unless all manufacturers of machines were to use a standard method of testing locking tonnages, it would be difficult to make a real comparison of various models within any selected range. Whether or not builders of die casting machinery will feel the need to adopt some sort of standard measurements, as the manufacturers of plastic injection molding machines are now doing, remains to be seen. So far, no action along these lines has been initiated.

CHANGE COMPANY NAME

Adopting a more appropriate name, Anderson Laboratories, Inc., have changed their corporate name to Anderson Chemical Co. Management, technical staff, and ownership remain the same.

Two new laboratories have recently been completed and new production facilities are being installed in the current expansion program. New technical personnel are also being added to the staff. Anderson Chemical Co. is a basic producer of ethyl silicate, methyl borate and other organometallic compounds.

RANSBURG PLANS BUILDING

Plans for a $1-million building and expansion program have been announced by Ransburg Electro-Coating Corp., Indianapolis, Ind. Construction of the new single-story building, which is to be located at 4000 W. 56th St., Indianapolis, will begin later this year and is expected to be completed by late 1957.

The front section of the 80,000-sq. ft. building will house the administrative, sales, and engineering offices. The plant area in the rear section will be occupied by the engineering and test laboratories, manufacturing, and a warehouse.

OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Rd., Cleveland 15, Ohio.

DIE CASTING SUPERINTENDENT — For Molding Department of old established company. Newly created position. Must be good administrator and have a thorough knowledge of zinc and aluminum die casting. Location is in Wisconsin. Write Box No. 9156 stating qualifications and salary required. Reply will be kept confidential.

ALUMINUM PERMANENT MOLD DEPT. MANAGER — Need a man to manage the growing Aluminum Permanent Mold Dept. of a well established jobbing foundry in the Midwest. Must be able to design molds and be responsible for production of castings. Write Box No. 9256.

DIE CASTING SALESMAN wishes to relocate with small or medium size progressive firm. Has good following in Metropolitan New York and Eastern states. Write Box No. 9356.

WANTED — Used zinc die casting machine — all hydraulic — approximately 2 to 5 pounds capacity. State make, condition and price. Write Box No. 9456.

SALES REPRESENTATIVE — small zinc die casting plant with facilities for die making would like to make connection with good salesman. J. & F. Tool & Die Casting Corp., Athens, Pa.

FOR SALE — Die casting machine, Hydropress, type 2, 150 ton, 14" Ramstroke, 30" opening. Machine now in operation. Contact Master Mechanic, Redmond Company, Inc., Owosso, Mich.

ADDRESSES SDCE MEETING

Donald L. Colwell, director of laboratories, Apex Smelting Co., will address the first meeting this Fall to be held by the Cleveland branch of the Society of Die Casting Engineers. His topic will be, "Aluminum and Zinc Alloys in the Die Casting Process." The meeting will be held at 6:30 p.m., Tuesday, September 18, at Kiefer's Restaurant, 2519 Detroit Ave., Cleveland.

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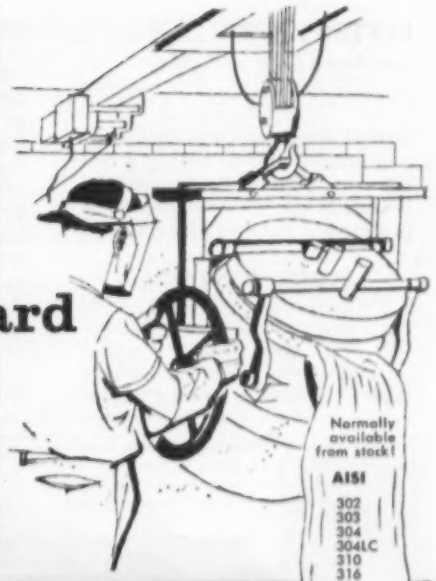

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LETTERS

continued from page 28

applied practically and economically for any specific type of product can only be determined by the engineers who have developed and applied the new process.—Ed.

SLUSH CASTINGS

We shall appreciate your advising if you know the name of anyone who does what is called "slush" casting from molds. This method is used in making trophy figures and small statuary figures in Brittania or other low melting white metal. A model is made, then a bronze mold, and cut away so that it can come apart in various pieces, these being cut so that they will pull away without under-cuts. The metal is poured into the mold, allowed to cool somewhat, and then the liquid metal in the center allowed to run out by what is known as a "bleeding" process, so that the figures are obtained hollow.

If you know of a firm or firms that does this type of casting, we will appreciate your giving us their names and addresses. — T.J.M. (President)

Information sent. — Ed.

FLUXING ALUMINUM

We are interested in receiving a copy of the available literature on the subject *Fluxing practice for aluminum* as mentioned on page 41 of the November 1955 issue of the publication "Precision Metal Molding". This item was listed as number (45d) in the January 21, 1956 issue of the newsletter Technical Survey. D.K.

Tear sheets of the article have been forwarded. — Ed.

DIE CASTER'S MARK

You will herewith find enclosed a copy of a trademark found inside a metal molded item. We would like to know the name of the manufacturer, or rather the die casting company that uses this trademark.—V. F. (Purchasing Agent)

We have a file which includes trademarks of many (although not all) die casters, and can often identify such marks. The one enclosed is the mark of Stewart Die Casting Div. of Stewart Warner Corp.—Ed.

SIGN MULTI-MILLION CONTRACT TO BUILD JET ENGINE ASSEMBLIES

Signing of a multi-million dollar contract for the manufacture of jet engine assemblies has been announced by Allis-Chalmers Manufacturing Company and the Aviation Gas Turbine Division of General Electric Company.

The contract calls for the manufacture of compressor rotors for the J-79 turbojet engine at Allis-Chalmers Terre Haute Works. One of the military aircraft using the engine is the F-104A Starfighter described by its manufacturer, Lockheed Aircraft Corporation, as the world's fastest combat plane.

According to L. W. Long, general manager of Allis-Chalmers Terre Haute Works, it will be approximately a year before the plant can be completely tooled for maximum production on the J-79 compressor rotor.

With the completion of new transformer production facilities now under construction at Terre Haute Works and when maximum production of the J-79 program is reached, employment at the Allis-Chalmers plant is expected to exceed 2,000 people.

YESTERDAY
TOMORROW
The Trend is with Badger...
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UP TO FULL **3 lb.** SHOT CAPACITY

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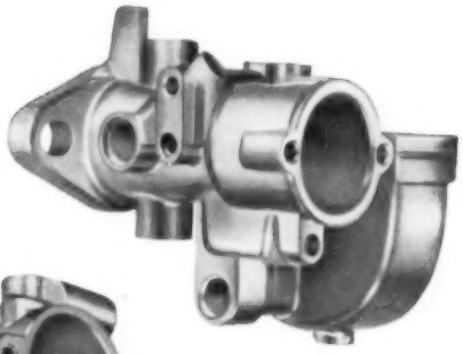

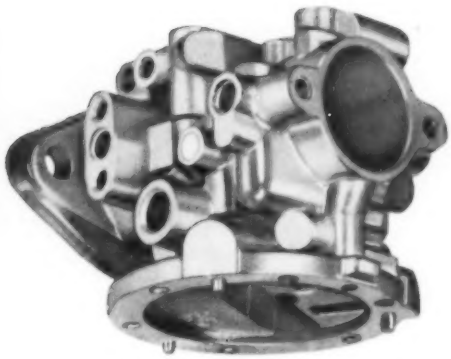

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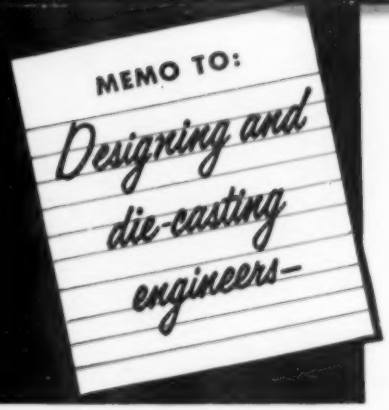

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Send for our helpful booklet, "Die Casting Alloys." Shows composition, properties, other data on Apex products. No obligation.

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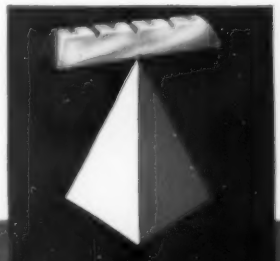

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